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VIA HAND DELIVERY & ELECTRONIC MAIL

October 20, 2022

Luly E. Massaro, Commission Clerk
Rhode Island Public Utilities Commission
89 Jefferson Boulevard
Warwick, RI 02888

RE: Docket No. 22-33-EE – 2023 Annual Energy Efficiency Plan
Rhode Island Technical Reference Manual for the 2023 Program Year &
Energy Efficiency Program Plan Studies

Dear Ms. Massaro:

On behalf of The Narragansett Electric Company d/b/a Rhode Island Energy ("Rhode Island Energy" or the "Company"), enclosed, please find the Company's Rhode Island Technical Reference Manual for Estimating Savings from Energy Efficiency Measures for the 2023 Program Year ("TRM") and five energy efficiency program measure and appendices as listed below ("EE Studies"). The TRM and EE Studies are being filed in support of the Company's 2023 Annual Energy Efficiency Program Plan as filed in the above-referenced docket.

EE Studies:

- Energy Efficiency Measures
- Appendices A through E

Thank you for your attention to this filing. If you have any questions or concerns, please do not hesitate to contact me at 401-709-3337.

Sincerely,

Leticia Pimentel

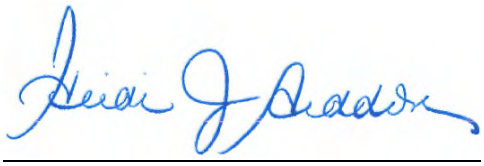
Leticia C. Pimentel

Enclosures
cc: Docket No. 22-33-EE Service List
Margaret L. Hogan, Esq., Division

Certificate of Service

I hereby certify that a copy of the cover letter and any materials accompanying this certificate were electronically transmitted to the individuals listed below.

The paper copies of this filing are being hand delivered to the Rhode Island Public Utilities Commission and to the Rhode Island Division of Public Utilities and Carriers.



Heidi J. Seddon

October 20, 2022
Date

Docket No. 22-33-EE – Rhode Island Energy's Energy Efficiency Plan 2023
Service list updated 10/18/22

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Rhode Island Energy™

Rhode Island
Technical Reference Manual

For Estimating Savings from Energy Efficiency Measures

2023 Program Year

Table of Contents

APPENDICES

Introduction

This *Rhode Island Technical Reference Manual* ("TRM") documents for regulatory agencies, customers, and other stakeholders the methodologies and assumptions used by Rhode Island Energy to estimate the savings, including reductions in energy and demand consumption and other resource and non-energy impacts, attributable to its electric and gas energy efficiency programs. This reference manual provides methods, formulas, and default assumptions for estimating energy, peak demand and other resource and non-energy impacts from efficiency measures.

Within this TRM, efficiency measures are organized by the sector for which the measure is eligible and by the primary energy source associated with the measure. The three sectors are Residential, Income Eligible and Commercial & Industrial ("C&I"). The primary energy sources addressed in this TRM are electricity and natural gas.

Each measure is presented as a "measure characterization." The measure characterizations provide mathematical equations for determining savings (algorithms), as well as default assumptions and sources, where applicable. In addition, any descriptions of calculation methods or baselines are provided as appropriate. The parameters for calculating savings are listed in the same order for each measure.

Algorithms are provided for estimating annual energy and peak demand impacts for primary and secondary energy sources if appropriate. In addition, algorithms or calculated results may be provided for other non-energy impacts (such as water savings or operation and maintenance cost savings). Assumptions are based on Rhode Island data where available. Where Rhode Island-specific data is not available, assumptions may be based on: 1) manufacturer and industry data, 2) a combination of the best available data from jurisdictions in the same region, or 3) engineering judgment to develop credible and realistic factors.

The TRM is reviewed and updated annually to reflect changes in technology, baselines, and evaluation results.

The TRM in the Context of Energy Efficiency Programs

Overview

The purpose of this section is to show how the TRM fits into the process of administering energy efficiency programs in Rhode Island. This section explains how the TRM is connected to the following efforts:

- Planning,
- Annual reporting,
- Updates to Rhode Island Energy tracking systems,
- Evolution of program and measure cost effectiveness analysis tools,
- Evaluation, Measurement and Verification ("EM&V"),
- Quality control.

Planning and Reporting

Rhode Island Energy is submitting this version of the RI TRM (the 2023 TRM) to the stakeholders along with its Energy Efficiency Program Plan ("EE Program Plan") for 2023.

The RI TRM provides regulators and stakeholders with documentation of the assumptions and algorithms that Rhode Island Energy will use in planning and reporting its energy savings for 2023. It can also be used to support qualification in ISO-New England Forward Capacity Market Auctions. However, due to the nature of planning, not all planning assumptions – such as those for Commercial and Industrial programs – are documented in this TRM. For these areas, the algorithms used to calculate planned savings are presented.

Updates to Program Administrator Tracking Systems

Rhode Island Energy maintains a tracking system that contains the energy efficiency data that it uses to meet its annual reporting to the RI PUC. The current design of the tracking system influences the types of assumptions and algorithms that appear in this TRM. The current algorithms leverage inputs that Rhode Island Energy collects.

Evolution of Program and Measure Cost Effectiveness Analysis Tools

The program and measure cost effectiveness analysis tools are Microsoft® Excel® workbooks used by Rhode Island Energy to ensure that the measures and programs that they implement meet the cost effectiveness requirements defined by the filed three year plans, standards, and annual plans. Rhode Island Energy also uses the output from the cost effectiveness analysis tools to develop the input (data, tables, and graphs) for its EE Program Plans and Year-End Reports. Rhode Island Energy envisions aligning the measure names and the categorization of measures in the TRM with the

measure names and categorization of measures in the cost effectiveness analysis tools either directly, or through the use of a translation tool.

Evaluation, Measurement and Verification

Evaluation, Measurement and Verification ("EM&V") ensures that the programs are evaluated, measured, and verified in a way that provides confidence to the public at large that the savings are real and in a way that enables Rhode Island Energy to report those savings to the EERMC and RI PUC with full confidence.

A secondary goal of creating a TRM is to identify areas where savings calculations can be improved. The TRM will inform future EM&V planning as a means to make these improvements.

For its Rhode Island programs, Rhode Island Energy may use evaluation results from other jurisdictions. For some of these, Rhode Island contributed sites and/or budgets. For others, the application of results from other jurisdictions is considered based on how similar the programs, delivery, and markets are to those in Rhode Island.

Quality Control

Regulators and stakeholders can use the TRM to confirm that savings inputs and calculations are reasonable and reliable. However, the TRM cannot be used by regulators and stakeholders to replicate the Company's reported savings. The TRM does not provide regulators and stakeholders with data inputs at a level that is detailed enough to enable replication of the savings reported by Rhode Island Energy. These calculations occur within tracking systems, within separate Excel workbooks, and within cost effectiveness analysis tools. However, in the event that regulators and stakeholders request that Rhode Island Energy provide tracking system details, the reproduction of reported data will be possible using the TRM.

TRM Update Process

Overview

This section describes the process for updating the TRM. The update process is synchronized with the filing of EE Program Plans.

Updates to the TRM can include:

- additions of new measures,
- updates to existing TRM measures due to:
  - o changes in baseline equipment or practices, affecting measure savings
  - o changes in efficient equipment or practices, affecting measure savings
  - o changes to deemed savings due the revised assumptions for algorithm parameter values (e.g., due to new market research or evaluation studies)
  - o other similar types of changes,
- updates to impact factors (e.g., due to new impact evaluation studies),
- discontinuance of existing TRM measures, and
- updates to the glossary and other background material included in the TRM.

Each TRM is associated with a specific program year, which corresponds to the calendar year. The TRM for each program year is updated over time as needed to both plan for future program savings and to report actual savings.

Key Stakeholders and Responsibilities

Key stakeholders and their responsibilities for the TRM updates are detailed in the following table.

Stakeholder	Responsibilities
Rhode Island Energy	• Identify and perform needed updates to the TRM • Provide TRM to interested stakeholders
Rhode Island EERMC and Division of Public Utilities and Carriers	• Review; suggest modifications; and accept TRM • Assure coordination with Rhode Island Energy submissions of program plans and reported savings

Jointly	• Administrative coordination of TRM activities, including:
	  • Assure collaboration and consensus regarding TRM updates
	  • Assure updates are compiled and incorporated into the TRM
	  • Coordinate with related program activities (e.g., evaluation and program reporting processes)

TRM Update Cycle

The description below indicates the main milestones of the TRM update cycle over a period of two years. The identifier "program year" or "PY" is used to show that this cycle will be repeated every year. For example, for the 2023 Program Year, compilation of updates continues up through September 2022, for submission in the TRM in October 2022.

September PY-2 to September PY-1: The PY TRM will be updated as needed based on evaluation studies and any other updates.

After the PY-1 TRM has been filed, there may be updates to the TRM. The most common updates to the TRM will result from new evaluation studies. Results of evaluation studies will be integrated into the next version of the TRM as the studies are completed. Other updates may include the results of group discussions to adopt latest research or the addition or removal of energy efficiency measures

October/November (PY-1) prior to program year: The PY TRM is filed with Rhode Island Energy's PY EE program plan

The PY TRM is submitted to the PUC jointly with Rhode Island Energy's EE program plan. With regard to the program plans, the TRM is considered a "planning document" in that it provides the documentation for how the Company *plan* to count savings for that program year. The TRM is not intended to fully document how the Company develop their plan estimates for savings.

January PY: Rhode Island Energy begins to track savings based on the PY TRM

Beginning in January PY, Rhode Island Energy will track savings for the PY based on the PY TRM.

Measure Characterization Structure

This section describes the common entries or inputs that make up each measure characterization. A formatted template follows the descriptions of each section of the measure characterization.

Source citations: The source of each assumption or default parameter value should be properly referenced in a footnote.

Applicability: All Measures shown within the 2023 TRM are active for the 2023 Program Year: from 1/1/2023 to 12/31/2023

Measure Description Overview

This section will include a plain text description of the efficient and baseline technology and the benefit(s) of its installation, as well as subfields of supporting information including:

Fuel: The fuel against which savings are being claimed, and the program from which EE incentives are being drawn

Sector: Indicates whether measure is Residential, Income Eligible or Commercial and Industrial

Project Type: Indicates if measure is Retrofit or New Construction / Time of Replacement

Category: Indicates the measure category, for example: Lighting, HVAC, Hot Water, Products, Food Service, Compressed Air, Motors/Drives, Refrigeration, Behavior, Custom, etc.

Type and Sub-type: Further measure classification for purposes of sorting measures

Program Name: The current program name under which the measure is being delivered.

Measure Name: A single device or behavior may be analyzed as a range of measures depending on a variety of factors which largely translate to where it is and who is using it. Such factors include hours of use, location, and baseline (equipment replaced or behavior modified). For example, the same screw-in LED lamp will produce different savings if installed in an emergency room waiting area than if installed in a bedside lamp.

Measure Description: Description of the energy efficiency measure, its benefits, and applications.

Baseline Description: Description of the assumed equipment/operation efficiency in the absence of program intervention. Multiple baselines will be provided as needed, e.g., for different markets. Baselines may refer to reference tables or may be presented as a table for more complex measures)

Savings Principle: The means by which the measure saves energy relative to the baseline. Description of the assumed or calculated equipment/operation efficiency from which the energy

and demand savings are determined. The high efficiency case may be based on specific details of the measure installation, minimum requirements for inclusion in the program, or an energy efficiency case based on historical participation. It may refer to tables within the measure characterization or in the appendices or efficiency standards set by organizations such as ENERGY STAR or the Consortium for Energy Efficiency

Savings Calculation method: How the savings values are determined; in most cases, values are either deemed or calculated

Savings unit: required minimum unit / characteristic for claiming listed savings values

Savings

This section includes various information on the measure savings and how they are determined.

- **Summary Average Gross Savings per Unit by Program:** This table summarizes the resource savings (kWh, kW, MMBtu) of all efficiency offerings within a measure category via a weighted average of their savings. This is only for illustrating savings and does not correspond to how savings are tracked
    - **Program:** This describes the programs in which the measures are offered. Some measures are offered in multiple programs

Sector and Program name mapping will be as follows:

Sector	Fuel	Full Program Name
Residential	Electric	EnergyStar® Homes
		EnergyStar® HVAC
		Energy Wise Single-Family
		EnergyWise Multifamily
		Behavior/Home Energy Reports
		EnergyStar® Products
		Residential ConnectedSolutions
	Gas	EnergyStar® Heating System
		EnergyWise Multifamily
		Behavior/Home Energy Reports
		EnergyWise Single-Family
		Residential New Construction
Income Eligible	Electric	Single Family Appliance Management
		Income Eligible Retrofit Multifamily
	Gas	Low Income Retrofit 1-4
		Low Income Multifamily
Commercial & Industrial	Electric	Large Commercial New Construction
		Large C&I Retrofit
		Small Business
		Commercial ConnectedSolutions
	Gas	Large Commercial New Construction
		Large C&I Retrofit
		Small Business Direct Install
		Commercial & Industrial Multifamily

- **Algorithm Type:** This section describes which of four methods of savings calculation applies to a measure
    - Deemed: The same savings are allocated to every unit of a measure
    - Engineering Algorithm with Deemed Inputs: Measure savings are calculated with an engineering formula, the inputs of which are constant for all units of a measure.
    - Engineering Algorithm with Site Specific Inputs: Measure savings are calculated with an engineering formula, the inputs of which depend on data from the installation site.
    - Custom: Each unit of a measure receives a unique savings calculation that depends on site specific data.
- **Units:** This section describes what is installed or affected by an efficiency measure (e.g. a boiler or a participant). It defines the quantity counted for savings.
- **Algorithm:** This section will describe the method for calculating the primary energy savings in appropriate units, i.e., kWh for electric energy savings or MMBtu for natural gas energy savings. The savings algorithm will be provided in a form similar to the following

  $\Delta kWh = \Delta kW \times Hours$

  Similarly, the method for calculating electric demand savings will be provided in a form similar to the following:

  $\Delta kW = (Watts_{BASE} - Watts_{EE})/1000$

  Below the savings algorithms, a table contains the definitions (and, in some cases, default values) of each input in the equation(s). The inputs for a particular measure may vary and will be reflected as such in this table (see example below).

- **Hours**: The operating hours for equipment that is either on or off, or equivalent full load hours for technologies that operate at partial loads, or reduced hours for controls. Reference tables will be used as needed to avoid repetitive entries.

ΔkWh	=	gross annual kWh savings from the measure
ΔkW	=	gross connected kW savings from the measure
Hours	=	average hours of use per year
WattsBASE	=	baseline connected kW
WattsEE	=	energy efficient connected kW

- **Measure Gross Savings per Unit:** This table summarizes the unit resource impacts of each efficiency offering within a measure category (e.g., the savings for boilers of different efficiencies and ratings in the Boiler measure category). The source for each value is referenced.

- **Non-Energy Impacts:** The non-energy impacts are shown for each efficiency measure under Annual and One-Time headings, depending on their recommended application approach. The NEIs are shown with more detail in Appendix B.

- **Measure Life:** Measure Life includes equipment life and the effects of measure persistence. Equipment life is the number of years that a measure is installed and will operate until failure. Measure persistence takes into account business turnover, early retirement of installed equipment, and other reasons measures might be removed or discontinued**.**

Other impact factors are defined in the next section.

Impact Factors for Calculating Adjusted Gross and Net Savings

Rhode Island Energy uses the algorithms in the Measure Characterization sections to calculate the gross savings for energy efficiency measures. Impact factors are then applied to make various adjustments to the gross savings estimate to account for the performance of individual measures or energy efficiency programs as a whole in achieving energy reductions as assessed through evaluation studies. Impacts factors address both the technical performance of energy efficiency measures and programs, accounting for the measured energy and demand reductions realized compared to the gross estimated reductions, as well as the programs' effect on the market for energy efficient products and services.

This section describes the types of impact factors used to make such adjustments, and how those impacts are applied to gross savings estimates. Definitions of the impact factors and other terms are also provided in the Glossary (Appendix E).

Types of Impact Factors

The impact factors used to adjust savings fall into one of two categories:

Impact factors used to adjust gross savings:

- In-Service Rate ("ISR")
- Savings Persistence Factor ("SPF")
- Realization Rate ("RR")
- Summer and Winter Peak Demand Coincidence Factors ("CF").

Impact factors used to calculate net savings:

- Free-Ridership ("FR") and Spillover ("SO") Rates
- Net-to-Gross Ratios ("NTG").

The **in-service rate** is the actual portion of efficient units that are installed. For example, efficient lamps may have an in-service rate less than 1.00 since some lamps are purchased as replacement units and are not immediately installed. The ISR is 1.00 for most measures.

The **savings persistence factor** is the portion of first-year energy or demand savings expected to persist over the life of the energy efficiency measure. The SPF is developed by conducting surveys of installed equipment several years after installation to determine the actual operational capability of the equipment. The SPF is 1.00 for most measures.

In contrast to savings persistence, *measure persistence* takes into account business turnover, early retirement of installed equipment, and other reasons the installed equipment might be removed or discontinued. Measure persistence is generally incorporated as part of the measure life, and therefore is not included as a separate impact factor.

The **realization rate** is used to adjust the gross savings (as calculated by the savings algorithms) based on impact evaluation studies. The realization rate is equal to the ratio of measure savings developed from an impact evaluation to the estimated measure savings derived from the savings algorithms. The realization rate does not include the effects of any other impact factors. Depending on the impact evaluation study, there may be separate realization rates for energy (kWh), peak demand (kW), or fossil fuel energy (MMBtu).

A **coincidence factor** adjusts the connected load kW savings derived from the savings algorithm. A coincidence factor represents the fraction of the connected load reduction expected to occur at the same time as a particular system peak period. The coincidence factor includes both coincidence and diversity factors combined into one number, thus there is no need for a separate diversity factor in this TRM.

Coincidence factors are provided for the on-peak period as defined by the ISO New England for the Forward Capacity Market ("FCM") and are calculated consistently with the FCM methodology. Electric demand reduction during the ISO New England peak periods is defined as follows:

- Summer On-Peak: average demand reduction from 1:00-5:00 PM on non-holiday weekdays in June July, and August
- Winter On-Peak: average demand reduction from 5:00-7:00 PM on non-holiday weekdays in December and January

The values described as Coincidence Factors in the TRM are not always consistent with the strict definition of a Coincidence Factor (CF). It would be more accurate to define the Coincidence Factor as "the value that is multiplied by the Gross kW value to calculate the average kW reduction coincident with the on-peak periods." A coincidence factor of 1.00 may be used because the coincidence is already included in the estimate of Gross kW; this is often the case when the "Max kW Reduction" is not calculated and instead the "Gross kW" is estimated using the annual kWh reduction estimate and a load shape model.

A **free-rider** is a customer who participates in an energy efficiency program (and gets an incentive) but who would have installed some or all of the same measure(s) on their own, with no change in timing of the installation, if the program had not been available. The **free-ridership rate** is the percentage of savings attributable to participants who would have installed the measures in the absence of program intervention.

The **spillover rate** is the percentage of savings attributable to a measure or program, but additional to the gross (tracked) savings of a program. Spillover includes the effects of 1) participants in the program who install additional energy efficient measures outside of the program as a result of participating in the program, and 2) non-participants who install or influence the installation of energy efficient measures as a result of being aware of the program. These two components are the **participant spillover** (SOP) and **non-participant spillover** (SONP).

The **net savings** value is the final value of savings that is attributable to a measure or program. Net savings differs from gross savings because it includes the effects of the free-ridership and/or spillover rates.

The **net-to-gross** ratio is the ratio of net savings to the gross savings adjusted by any impact factors (i.e., the "adjusted" gross savings). Depending on the evaluation study, the NTG ratio may be determined from the free-ridership and spillover rates, if available, or it may be a distinct value with no separate specification of FR and SO values.

Standard Net–to–Gross Formulas

The TRM measure entries provide algorithms or methodologies for calculating the gross energy and demand savings for each category of efficiency measures. The following standard formulas show how the impact factors are applied to calculate the net savings. These are the calculations used by Rhode Island Energy to track and report gross and net savings for its energy efficiency programs in Rhode Island.

- **Calculation of Net Annual Electric Energy Savings**

  $net\_kWh = gross\_kWh \times SPF \times ISR \times RRE \times NTG$

- **Calculation of Net Summer Electric Peak Demand Coincident kW Savings**

  $net\_kW_{SP} = gross\_kW \times SPF \times ISR \times RR_{SP} \times CF_{SP} \times NTG$

- **Calculation of Net Winter Electric Peak Demand Coincident kW Savings**

  $net\_kW_{WP} = gross\_kW \times SPF \times ISR \times RR_{WP} \times CF_{WP} \times NTG$

- **Calculation of Net Annual Natural Gas Energy Savings**

  $net\_MMBtu = gross\_MMBtu \times SPF \times ISR \times RR_{G} \times NTG$

Where:
Gross_kWh = Gross Annual kWh Savings
net_kWh = Net Annual kWh Savings
$Gross\_kW_{SP}$ = Gross Connected kW Savings (summer peak)
$Gross\_kW_{WP}$ = Gross Connected kW Savings (winter peak)
net_kW_{SP} = Adjusted Gross Connected kW Savings (winter peak)
net_kW_{WP} = Net Coincident kW Savings (winter peak)
Gross_MMBtu = Gross Annual MMBtu Savings
net_MMBtu = Net Annual MMBtu Savings
SPF = Savings Persistence Factor
ISR = In-Service Rate
CF_{SP} = Peak Coincidence Factor (summer peak)
CF_{WP} = Peak Coincidence Factor (winter peak)
RR_{E} = Realization Rate for electric energy (kWh)
RR_{G} = Realization Rate for gas (MMBtu)

RR_{SP} = Realization Rate for summer peak kW
RR_{WP} = Realization Rate for winter peak kW
NTG = Net-to-Gross Ratio
FR = Free-Ridership Factor
SOP = Participant Spillover Factor
SONP = Non-Participant Spillover Factor

Depending on the evaluation study methodology:

- NTG is equal to (1 – FR + SO_P + SO_{NP}), or
- NTG is a single value with no distinction of FR, SO_P, SO_{NP}, and/or other factors that cannot be reliably isolated.

Measure Characterizations

Table of Contents for Measure Characterizations

Residential

Energy Star Homes, Electric

Energy Star HVAC, Electric

Energy Wise Single-Family, Electric

Energy Wise Multifamily, Electric

Energy Star Heating System, Gas

Energy Wise Multifamily, Gas

Behavior, Gas

Energy Wise Single-Family, Gas

Residential New Construction, Gas

Income Eligible

Single Family - Appliance Management, Electric

Low Income Retrofit Multifamily, Electric

Low Income Multifamily, Gas

C&I

Large Commercial New Construction, Electric

Large C&I Retrofit, Electric

C&I Small Business Direct Install, Gas

Large C&I Retrofit, Gas

Large Commercial New Construction, Gas

Residential

Adaptive Reuse

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Adaptive Reuse

Program: A02a Energy Star Homes

Measure Description

To capture lost opportunities, encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards net-zero energy.

Baseline Description

The User Defined Reference Home was revised in 2012 as a result of a baseline study.

Savings Principle

The high efficiency case is represented by the specific energy characteristics of each "as-built" home completed through the program.

Savings Method

Calculated using site-specific inputs

Unit

Completed ESH heating, cooling, or DHW project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Adaptive Reuse	Calc	Calc	0.00	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Adaptive Reuse	15	1.00	1.00		1.00	1.00	1.00	0.24	0.89

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Adaptive Reuse	0.90%	4.10%	53.80%	41.20%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Adaptive Reuse	0.00	0.00	117.00	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Adaptive Reuse	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

CODES AND STANDARDS

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Codes and Standards | **Measure Sub Type:** Codes and Standards

Program: A02a Energy Star Homes

Measure Description

Energy efficiency code trainings and advocacy work to improve energy efficiency of buildings and equipment within Rhode Island.

Baseline Description

Un-influenced adoption curve of federal minimum codes and standards.

Savings Principle

Accelerated adoption of advancing energy codes and equipment standards.

Savings Method

Calculated based on attribution study

Unit

Adoption of advancing energy codes and equipment standards.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
CODES AND STANDARDS	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
CODES AND STANDARDS	12	1.00	1.00		1.00	1.00	1.00	0.24	0.89

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
CODES AND STANDARDS	34.00%	51.00%	8.00%	7.00%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
CODES AND STANDARDS	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
CODES AND STANDARDS	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

Cooling_Tier1

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Cooling

Program: A02a Energy Star Homes

Measure Description

To capture lost opportunities, encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards net-zero energy.

Baseline Description

The User Defined Reference Home was revised in 2012 as a result of a baseline study.

Savings Principle

The high efficiency case is represented by the specific energy characteristics of each "as-built" home completed through the program.

Savings Method

Calculated using site-specific inputs

Unit

Completed ESH heating, cooling, or DHW project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Cooling_Tier1	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Supplied by vendor

Electric kW Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Cooling_Tier1	25	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Cooling_Tier1	6.59%	3.85%	47.32%	42.24%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Cooling_Tier1	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Cooling_Tier1	0.25	0.00	0.00	0.75

NTG Source: NMR Group, Inc (2021). Low Rise NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

Cooling_Tier2

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Cooling

Program: A02a Energy Star Homes

Measure Description

To capture lost opportunities, encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards net-zero energy.

Baseline Description

The User Defined Reference Home was revised in 2012 as a result of a baseline study.

Savings Principle

The high efficiency case is represented by the specific energy characteristics of each "as-built" home completed through the program.

Savings Method

Calculated using site-specific inputs

Unit

Completed ESH heating, cooling, or DHW project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Cooling_Tier2	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Supplied by vendor

Electric kW Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Cooling_Tier2	25	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Cooling_Tier2	6.59%	3.85%	47.32%	42.24%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Cooling_Tier2	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Cooling_Tier2	0.25	0.00	0.00	0.75

NTG Source: NMR Group, Inc (2021). Low Rise NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

Cooling_Tier3

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Cooling

Program: A02a Energy Star Homes

Measure Description

To capture lost opportunities, encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards net-zero energy.

Baseline Description

The User Defined Reference Home was revised in 2012 as a result of a baseline study.

Savings Principle

The high efficiency case is represented by the specific energy characteristics of each "as-built" home completed through the program.

Savings Method

Calculated using site-specific inputs

Unit

Completed ESH heating, cooling, or DHW project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Cooling_Tier3	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Supplied by vendor

Electric kW Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Cooling_Tier3	25	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Cooling_Tier3	6.59%	3.85%	47.32%	42.24%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Cooling_Tier3	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Cooling_Tier3	0.25	0.00	0.00	0.75

NTG Source: NMR Group, Inc (2021). Low Rise NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

COOLINGCP

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** COOLINGCP

Program: A02a Energy Star Homes

Measure Description

To capture lost opportunities, encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards net-zero energy.

Baseline Description

The User Defined Reference Home was revised in 2012 as a result of a baseline study.

Savings Principle

The high efficiency case is represented by the specific energy characteristics of each "as-built" home completed through the program.

Savings Method

Calculated using site-specific inputs

Unit

Completed ESH heating, cooling, or DHW project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
COOLINGCP	Calc	Calc	0.00	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
COOLINGCP	25	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
COOLINGCP	6.59%	3.85%	47.32%	42.24%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
COOLINGCP	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
COOLINGCP	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

CWASHER

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Whole Home | **Measure Type:** Clothes Washer | **Measure Sub Type:** Clothes Washer

Program: A02a Energy Star Homes

Measure Description

The installation of an Energy Star clothes washer in a Residential New Construction home.

Baseline Description

A standard non-Energy Star clothes washer.

Savings Principle

An Energy Star clothes washer uses less electricity and water to clean clothes.

Savings Method

Deemed

Unit

Installed clothes washer.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
CWASHER	47.5	0.0200	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
CWASHER	11	1.00	1.00		1.00	1.00	1.00	0.89	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
CWASHER	26.00%	40.00%	14.00%	20.00%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
CWASHER	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
CWASHER	0.30	0.00	0.00	0.70

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: Assumed to equal incentive amount. per housing Unit

DHW_Tier1

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** DHW

Program: A02a Energy Star Homes

Measure Description

To capture lost opportunities, encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards net-zero energy.

Baseline Description

The User Defined Reference Home was revised in 2012 as a result of a baseline study.

Savings Principle

The high efficiency case is represented by the specific energy characteristics of each "as-built" home completed through the program.

Savings Method

Calculated using site-specific inputs

Unit

Completed ESH heating, cooling, or DHW project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
DHW_Tier1	Calc	Calc	0.00	0.00	0.00	Calc	Calc

Electric kWh Note: Supplied by vendor

Electric kW Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
DHW_Tier1	15	1.00	1.00		1.00	1.00	1.00	0.00	0.81

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
DHW_Tier1	41.52%	31.39%	15.22%	11.88%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
DHW_Tier1	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
DHW_Tier1	0.25	0.00	0.00	0.75

NTG Source: NMR Group, Inc (2021). Low Rise NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

DHW_Tier2

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** DHW

Program: A02a Energy Star Homes

Measure Description

To capture lost opportunities, encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards net-zero energy.

Baseline Description

The User Defined Reference Home was revised in 2012 as a result of a baseline study.

Savings Principle

The high efficiency case is represented by the specific energy characteristics of each "as-built" home completed through the program.

Savings Method

Calculated using site-specific inputs

Unit

Completed ESH heating, cooling, or DHW project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
DHW_Tier2	Calc	Calc	0.00	0.00	0.00	Calc	Calc

Electric kWh Note: Supplied by vendor

Electric kW Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
DHW_Tier2	15	1.00	1.00		1.00	1.00	1.00	0.00	0.81

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
DHW_Tier2	41.52%	31.39%	15.22%	11.88%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
DHW_Tier2	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
DHW_Tier2	0.25	0.00	0.00	0.75

NTG Source: NMR Group, Inc (2021). Low Rise NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

DHW_Tier3

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** DHW

Program: A02a Energy Star Homes

Measure Description

To capture lost opportunities, encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards net-zero energy.

Baseline Description

The User Defined Reference Home was revised in 2012 as a result of a baseline study.

Savings Principle

The high efficiency case is represented by the specific energy characteristics of each "as-built" home completed through the program.

Savings Method

Calculated using site-specific inputs

Unit

Completed ESH heating, cooling, or DHW project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
DHW_Tier3	Calc	Calc	0.00	0.00	0.00	Calc	Calc

Electric kWh Note: Supplied by vendor

Electric kW Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
DHW_Tier3	15	1.00	1.00		1.00	1.00	1.00	0.00	0.81

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
DHW_Tier3	41.52%	31.39%	15.22%	11.88%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
DHW_Tier3	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
DHW_Tier3	0.25	0.00	0.00	0.75

NTG Source: NMR Group, Inc (2021). Low Rise NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

DHWCP

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** DHW

Program: A02a Energy Star Homes

Measure Description

To capture lost opportunities, encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards net-zero energy.

Baseline Description

The User Defined Reference Home was revised in 2012 as a result of a baseline study.

Savings Principle

The high efficiency case is represented by the specific energy characteristics of each "as-built" home completed through the program.

Savings Method

Calculated using site-specific inputs

Unit

Completed ESH heating, cooling, or DHW project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
DHWCP	Calc	Calc	0.00	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
DHWCP	15	1.00	1.00		1.00	1.00	1.00	0.00	0.81

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
DHWCP	41.52%	31.39%	15.22%	11.88%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
DHWCP	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
DHWCP	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

DISHWASH

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Whole Home | **Measure Type:** Dishwasher | **Measure Sub Type:** Dishwasher

Program: A02a Energy Star Homes

Measure Description

The installation of an Energy Star Dishwasher in a Residential New Construction home.

Baseline Description

A standard non-Energy Star Dishwasher.

Savings Principle

An Energy Star dishwasher uses less electricity and water to clean dishes.

Savings Method

Deemed

Unit

Installed dish washer.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
DISHWASH	40.0	0.0048	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
DISHWASH	10	1.00	1.00		1.00	1.00	1.00	0.90	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
DISHWASH	26.00%	40.00%	14.00%	20.00%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
DISHWASH	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
DISHWASH	0.91	0.00	0.00	0.09

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: Assumed to equal incentive amount. per housing Unit

Heating_Tier1

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Heating

Program: A02a Energy Star Homes

Measure Description

To capture lost opportunities, encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards net-zero energy.

Baseline Description

The User Defined Reference Home was revised in 2012 as a result of a baseline study.

Savings Principle

The high efficiency case is represented by the specific energy characteristics of each “as-built” home completed through the program.

Savings Method

Calculated using site-specific inputs

Unit

Completed ESH heating, cooling, or DHW project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heating_Tier1	Calc	Calc	0.00	0.00	0.00	Calc	Calc

Electric kWh Note: Supplied by vendor

Electric kW Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heating_Tier1	25	1.00	1.00		1.00	1.00	1.00	0.00	0.43

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heating_Tier1	43.13%	56.87%	0.00%	0.00%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heating_Tier1	0.00	0.00	142.33	0

Annual $ Source: NMR Group, Inc (2021). Residential New Construction Quick Hit NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heating_Tier1	0.25	0.00	0.00	0.75

NTG Source: NMR Group, Inc (2021). Low Rise NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $1,445.00 / home

Incentive: $885.00 / home

Heating_Tier2

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Heating

Program: A02a Energy Star Homes

Measure Description

To capture lost opportunities, encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards net-zero energy.

Baseline Description

The User Defined Reference Home was revised in 2012 as a result of a baseline study.

Savings Principle

The high efficiency case is represented by the specific energy characteristics of each "as-built" home completed through the program.

Savings Method

Calculated using site-specific inputs

Unit

Completed ESH heating, cooling, or DHW project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heating_Tier2	Calc	Calc	0.00	0.00	0.00	Calc	Calc

Electric kWh Note: Supplied by vendor

Electric kW Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heating_Tier2	25	1.00	1.00		1.00	1.00	1.00	0.00	0.43

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heating_Tier2	43.13%	56.87%	0.00%	0.00%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heating_Tier2	0.00	0.00	142.33	0

Annual $ Source: NMR Group, Inc (2021). Residential New Construction Quick Hit NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heating_Tier2	0.25	0.00	0.00	0.75

NTG Source: NMR Group, Inc (2021). Low Rise NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $4,860.00 / home

Incentive: $1,525.00 / home

Heating_Tier3

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Heating

Program: A02a Energy Star Homes

Measure Description

To capture lost opportunities, encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards net-zero energy.

Baseline Description

The User Defined Reference Home was revised in 2012 as a result of a baseline study.

Savings Principle

The high efficiency case is represented by the specific energy characteristics of each "as-built" home completed through the program.

Savings Method

Calculated using site-specific inputs

Unit

Completed ESH heating, cooling, or DHW project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heating_Tier3	Calc	Calc	0.00	0.00	0.00	Calc	Calc

Electric kWh Note: Supplied by vendor

Electric kW Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heating_Tier3	25	1.00	1.00		1.00	1.00	1.00	0.00	0.43

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heating_Tier3	43.13%	56.87%	0.00%	0.00%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heating_Tier3	0.00	0.00	142.33	0

Annual $ Source: NMR Group, Inc (2021). Residential New Construction Quick Hit NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heating_Tier3	0.25	0.00	0.00	0.75

NTG Source: NMR Group, Inc (2021). Low Rise NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $7,688.00 / home

Incentive: $2,650.00 / home

HEATINGCP

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Heating

Program: A02a Energy Star Homes

Measure Description

To capture lost opportunities, encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards net-zero energy.

Baseline Description

The User Defined Reference Home was revised in 2012 as a result of a baseline study.

Savings Principle

The high efficiency case is represented by the specific energy characteristics of each "as-built" home completed through the program.

Savings Method

Calculated using site-specific inputs

Unit

Completed ESH heating, cooling, or DHW project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
HEATINGCP	Calc	Calc	0.00	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
HEATINGCP	25	1.00	1.00		1.00	1.00	1.00	0.00	0.43

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
HEATINGCP	43.13%	56.87%	0.00%	0.00%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
HEATINGCP	0.00	0.00	142.33	0

Annual $ Source: NMR Group, Inc (2021). Residential New Construction Quick Hit NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
HEATINGCP	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $787.00 / home

Incentive: $345.00 / home

LED Fixture

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** LED Fixture

Program: A02a Energy Star Homes

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly longer lamp lifetimes.

Baseline Description

The baseline efficiency case is blend of incandescent, CFLs and other bulbs types, as provided by market research or for a home energy audit, the base line is a 65 Watt incandescent.

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED fixture.

Savings Method

Calculated using deemed inputs

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = Qty × deltakW × Hours

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

DeltakW = Deemed average kW reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 985.5.

Hours Source: Nexus Market Research and RLW Analytics (2004). Impact Evaluation of the Massachusetts, Rhode Island, and Vermont 2003 Residential Lighting Programs.

Hours Note: The average annual operating hours are 912.5 hours/year or calculated for home audit applications.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
LED Fixture	68.9	0.0600	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: MA Residential Lighting Worksheet 2017, including reference to Market Adoption Model

Electric kW Source: MA Residential Lighting Worksheet 2017, including reference to Market Adoption Model

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
LED Fixture	1	0.95	1.00		1.00	1.00	1.00	0.13	0.16

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
LED Fixture	26.00%	40.00%	14.00%	20.00%

Measure Life Note: Based on MA EUL assumptions

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: NMR Group, Northeast Residential Lighting Hours-of-Use Study, May 2014

CFwp Source: NMR Group, Northeast Residential Lighting Hours-of-Use Study, May 2014

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
LED Fixture	0.00	0.00	0	3.50

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
LED Fixture	0.70	0.04	0.00	0.34

NTG Source: NMR Group (2012). Rhode Island 2011 Basline Study of Single-Family Residential New Construction. Prepared for national Grid.

LEDs

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** LED Screw Base

Program: A02a Energy Star Homes

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly longer lamp lifetimes.

Baseline Description

The baseline efficiency case is blend of incandescent, halogens, CFLs and other bulbs types, as provided by market research or for EISA exempt bulbs and bulbs installed through an home energy audit, the base line is a 65 Watt incandescent.

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED fixture.

Savings Method

Calculated using deemed inputs

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: 946.4.

Hours Source: MA19R12-E - Residential Lighting Hours-of-Use Quick Hit Study

Hours Note: hrs/yr

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
LEDs	36.1	0.0120	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: NMR (2020). MA19R09-E - Delta Watts Update/MA19R12-E - Residential Lighting Hours-of-Use Quick Hit Study

Electric kW Source: NMR (2020). MA19R09-E - Delta Watts Update/MA19R12-E - Residential Lighting Hours-of-Use Quick Hit Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
LEDs	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
LEDs	35.10%	30.80%	19.00%	15.10%

Measure Life Note: Based on MA EUL assumptions

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
LEDs	0.00	0.00	0	3.00

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
LEDs	0.70	0.00	0.00	0.30

NTG Source: NMR Group (2012). Rhode Island 2011 Basline Study of Single-Family Residential New Construction. Prepared for national Grid.

Refrigerators

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** Refrigerators | **Measure Sub Type:** Refrigerator

Program: A02a Energy Star Homes

Measure Description

This measure covers the replacement of an existing inefficient refrigerator with a new efficient refrigerator.

Baseline Description

Existing refrigerator continues to operate.

Savings Principle

The high efficiency case is an Energy Star® refrigerator or a model that is ENERGY STAR® rated and included in the Most Efficient® or Top Ten USA® ranking.

Savings Method

Calculated using deemed inputs

Unit

Installed refrigerator

Savings Equation

Gross kWh = Qty × (kWh_base - kWh_ee)

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

kWh_base = Deemed average demand per baseline unit.

kWh_ee = Deemed average demand per high-efficiency unit.

DeltakW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Refrigerators	104.0	0.0130	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Refrigerators	12	1.00	1.00		1.00	1.00	1.00	1.00	0.92

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Refrigerators	26.00%	40.00%	14.00%	20.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Refrigerators	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Refrigerators	0.54	0.00	0.00	0.46

NTG Note: Per C-team savings from evaluation are net. Gross Savings and NTGR provided by C-team.

TRC: ESH Bundled costs

Incentive: ESH Bundled costs

Renovation Rehab Cooling_Tier1

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Cooling

Program: A02a Energy Star Homes

Measure Description

The cooling savings resulting from Renovation Rehab projects that include the installation of roof, wall, and basement insulation.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Cooling_Tier1	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Supplied by vendor

Electric kW Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Cooling_Tier1	25	1.00	1.00		1.00	1.00	1.00	1.00	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Cooling_Tier1	0.90%	4.12%	53.82%	41.17%

Measure Life Note: Common measure life for insulation measures.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Cooling_Tier1	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Cooling_Tier1	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

Renovation Rehab Cooling_Tier2

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Cooling

Program: A02a Energy Star Homes

Measure Description

The cooling savings resulting from Renovation Rehab projects that include the installation of roof, wall, and basement insulation.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Cooling_Tier2	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Supplied by vendor

Electric kW Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Cooling_Tier2	25	1.00	1.00		1.00	1.00	1.00	1.00	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Cooling_Tier2	0.90%	4.12%	53.82%	41.17%

Measure Life Note: Common measure life for insulation measures.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Cooling_Tier2	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Cooling_Tier2	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

Renovation Rehab Cooling_Tier3

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Cooling

Program: A02a Energy Star Homes

Measure Description

The cooling savings resulting from Renovation Rehab projects that include the installation of roof, wall, and basement insulation.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Cooling_Tier3	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Supplied by vendor

Electric kW Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Cooling_Tier3	25	1.00	1.00		1.00	1.00	1.00	1.00	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Cooling_Tier3	0.90%	4.12%	53.82%	41.17%

Measure Life Note: Common measure life for insulation measures.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Cooling_Tier3	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Cooling_Tier3	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

Renovation Rehab CoolingCP

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Cooling

Program: A02a Energy Star Homes

Measure Description

The cooling savings resulting from Renovation Rehab projects that include the installation of roof, wall, and basement insulation.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab CoolingCP	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab CoolingCP	25	1.00	1.00		1.00	1.00	1.00	0.24	0.89

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab CoolingCP	0.90%	4.12%	53.82%	41.17%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab CoolingCP	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab CoolingCP	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

Renovation Rehab Domestic Hot Water_Tier1

Sector: Residential **Fuel:** Electric **Program Type:** Custom

Measure Category: Whole Home **Measure Type:** Custom **Measure Sub Type:** DHW

Program: A02a Energy Star Homes

Measure Description

The DHW savings resulting from Renovation Rehab projects that include more efficient water heating systems.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Domestic Hot Water_Tier1	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Supplied by vendor

Electric kW Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Domestic Hot Water_Tier1	15	1.00	1.00		1.00	1.00	1.00	1.00	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Domestic Hot Water_Tier1	35.84%	30.76%	17.26%	16.14%

Measure Life Note: Common measure life for insulation measures.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Domestic Hot Water_Tier1	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Domestic Hot Water_Tier1	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

Renovation Rehab Domestic Hot Water_Tier2

Sector: Residential **Fuel:** Electric **Program Type:** Custom

Measure Category: Whole Home **Measure Type:** Custom **Measure Sub Type:** DHW

Program: A02a Energy Star Homes

Measure Description

The DHW savings resulting from Renovation Rehab projects that include more efficient water heating systems.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Domestic Hot Water_Tier2	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Supplied by vendor

Electric kW Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Domestic Hot Water_Tier2	15	1.00	1.00		1.00	1.00	1.00	1.00	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Domestic Hot Water_Tier2	35.84%	30.76%	17.26%	16.14%

Measure Life Note: Common measure life for insulation measures.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Domestic Hot Water_Tier2	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Domestic Hot Water_Tier2	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

Renovation Rehab Domestic Hot Water_Tier3

Sector: Residential **Fuel:** Electric **Program Type:** Custom

Measure Category: Whole Home **Measure Type:** Custom **Measure Sub Type:** DHW

Program: A02a Energy Star Homes

Measure Description

The DHW savings resulting from Renovation Rehab projects that include more efficient water heating systems.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Domestic Hot Water_Tier3	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Supplied by vendor

Electric kW Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Domestic Hot Water_Tier3	15	1.00	1.00		1.00	1.00	1.00	1.00	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Domestic Hot Water_Tier3	35.84%	30.76%	17.26%	16.14%

Measure Life Note: Common measure life for insulation measures.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Domestic Hot Water_Tier3	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Domestic Hot Water_Tier3	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

Renovation Rehab Domestic Hot WaterCP

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** DHW

Program: A02a Energy Star Homes

Measure Description

The DHW savings resulting from Renovation Rehab projects that include more efficient water heating systems.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Domestic Hot WaterCP	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Domestic Hot WaterCP	25	1.00	1.00		1.00	1.00	1.00	0.24	0.89

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Domestic Hot WaterCP	35.84%	30.76%	17.26%	16.14%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Domestic Hot WaterCP	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Domestic Hot WaterCP	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

Renovation Rehab Heating_Tier1

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Heating

Program: A02a Energy Star Homes

Measure Description

The heating savings resulting from Renovation Rehab projects that include the installation of roof, wall, and basement insulation.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Heating_Tier1	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Supplied by vendor

Electric kW Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Heating_Tier1	25	1.00	1.00		1.00	1.00	1.00	1.00	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Heating_Tier1	37.81%	61.53%	0.17%	0.49%

Measure Life Note: Common measure life for insulation measures.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Heating_Tier1	0.00	0.00	142.33	0

Annual $ Source: NMR Group, Inc (2021). Residential New Construction Quick Hit NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Heating_Tier1	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $1,874.00 / home

Incentive: $900.00 / home

Renovation Rehab Heating_Tier2

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Heating

Program: A02a Energy Star Homes

Measure Description

The heating savings resulting from Renovation Rehab projects that include the installation of roof, wall, and basement insulation.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Heating_Tier2	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Supplied by vendor

Electric kW Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Heating_Tier2	25	1.00	1.00		1.00	1.00	1.00	1.00	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Heating_Tier2	37.81%	61.53%	0.17%	0.49%

Measure Life Note: Common measure life for insulation measures.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Heating_Tier2	0.00	0.00	142.33	0

Annual $ Source: NMR Group, Inc (2021). Residential New Construction Quick Hit NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Heating_Tier2	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $2,767.00 / home

Incentive: $1,520.00 / home

Renovation Rehab Heating_Tier3

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Heating

Program: A02a Energy Star Homes

Measure Description

The heating savings resulting from Renovation Rehab projects that include the installation of roof, wall, and basement insulation.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Heating_Tier3	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Supplied by vendor

Electric kW Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Heating_Tier3	25	1.00	1.00		1.00	1.00	1.00	1.00	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Heating_Tier3	37.81%	61.53%	0.17%	0.49%

Measure Life Note: Common measure life for insulation measures.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Heating_Tier3	0.00	0.00	142.33	0

Annual $ Source: NMR Group, Inc (2021). Residential New Construction Quick Hit NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Heating_Tier3	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $14,107.00 / home

Incentive: $2,643.00 / home

Renovation Rehab HeatingCP

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Heating

Program: A02a Energy Star Homes

Measure Description

The heating savings resulting from Renovation Rehab projects that include the installation of roof, wall, and basement insulation.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab HeatingCP	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab HeatingCP	25	1.00	1.00		1.00	1.00	1.00	0.24	0.89

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab HeatingCP	37.81%	61.53%	0.17%	0.49%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab HeatingCP	0.00	0.00	142.33	0

Annual $ Source: NMR Group, Inc (2021). Residential New Construction Quick Hit NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab HeatingCP	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $787.00 / home

Incentive: $345.00 / home

Showerheads

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: A02a Energy Star Homes

Measure Description

Installation of a low flow showerhead with a flow rate of 1.5 GPM or less.

Baseline Description

The baseline efficiency case is a showerhead with a flow of 2.5 gpm. For home audit applications, the baseline is the existing showerhead.

Savings Principle

The high efficiency is a low-flow showerhead with a flow of 1.5 gpm or less.

Savings Method

Deemed

Unit

Installed low-flow showerhead

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Showerheads	247.0	0.0590	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Showerheads	15	1.00	1.00		1.00	1.00	1.00	0.58	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Showerheads	40.00%	33.00%	15.00%	13.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

Measure Life Note: Massachusetts Common Assumption

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rates are 100% since savings estimates are based on evaluation results.

CFsp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

CFwp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Showerheads	3696.00	0.00	0	0

Water/Sewer Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Showerheads	0.00	0.00	0.00	1.00

ACDOWNSIZE

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Cooling | **Measure Sub Type:** Central AC

Program: A02b Energy Star HVAC

Measure Description

Reduction in system size consistent with manual J calculations.

Baseline Description

The baseline efficiency case is a system that is not sized in accordance with a manual J calculation.

Savings Principle

The high efficiency case is a system that is sized in accordance with a manual J calculation.

Savings Method

Deemed

Unit

Completed job (assume downsize 1/2 ton).

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
ACDOWNSIZE	203.0	0.2950	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Electric kW Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Electric kW Note: Updated based on historic measure mix.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
ACDOWNSIZE	18	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
ACDOWNSIZE	6.60%	3.80%	47.30%	42.20%

Measure Life Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
ACDOWNSIZE	0.00	0.00	0.64	0

Annual $ Note: MA values

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
ACDOWNSIZE	0.15	0.00	0.00	0.85

NTG Note: Massachusetts Common Assumption

TRC: $250.00 / measure

Incentive: $250.00 / measure

CENTRAL AC

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Cooling | **Measure Sub Type:** Central AC

Program: A02b Energy Star HVAC

Measure Description

The purchase and installation of high efficiency central air-conditioning (CAC) unit rather than a standard CAC system, and/or to replace an existing inefficient CAC system.

Baseline Description

The baseline efficiency case is a blend of code-compliant central air-conditioning system with SEER = 14 and EER = 11. For early replacement installations, the baseline is an HVAC unit with rated SEER = 13.5 and an actual SEER efficiency of 12.0.

Savings Principle

The high efficiency case is a SEER 16, EER 13 central AC unit.

Savings Method

Calculated using deemed inputs

Unit

Installed high-efficiency central AC system for cooling.

Savings Equation

Gross kWh = Tons × (kBtu/hr per ton) × (1/SEER_base - 1/SEER_ee) × Hours_C

Gross kW = Tons × (kBtu/hr per ton) × (1/SEER_base - 1/SEER_ee)

Where:

Tons = Deemed average equipment capacity: 2.7 tons for 16 SEER unit / 3.1 tons for 18 SEER unit

12 kBtu/hr per ton = Conversion factor

SEER_base = Seasonal Energy Efficiency Ratio of baseline equipment.

SEER_ee = Seasonal Energy Efficiency Ratio of new equipment.

Hours_C = Deemed average equivalent full load cooling hours

Hours: 419.0.

Hours Source: Navigant (2018). Res 1 - MA Residential Electric Load Shape and Baseline Study (Cooling and Heating Season report)

Hours Note: The equivalent full load cooling hours are 360 hours/year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
CENTRAL AC	223.2	0.3500	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Guidehouse (2021). Comprehensive TRM Review/RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Electric kWh Note: Baseline update can be found in first source and calculations for savings can be found in second source.

Electric kW Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Electric kW Note: Updated based on historic measure mix.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
CENTRAL AC	15	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
CENTRAL AC	6.60%	3.80%	47.30%	42.20%

Measure Life Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Massachusetts Common Assumption

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
CENTRAL AC	0.00	0.00	8.98	0

Annual $ Source: RI_PAs_2021-2023 PLAN Electric H&C Savings Workbook 08-11-2020

Annual $ Note: MA values

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
CENTRAL AC	0.34	0.22	0.00	0.88

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

TRC: $1,208.00 / measure

Incentive: $50.00 / measure

Central Heat Pump

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Heat Pumps | **Measure Sub Type:** Heat Pump Electrification

Program: A02b Energy Star HVAC

Measure Description

The installation of a high efficiency rated heat pump (15 SEER 9 HSPF).

Baseline Description

The baseline efficiency case is a non- energy efficiency® rated central heat pump with SEER 14, HSPF 8.7.

Savings Principle

The high efficiency case is a high-efficiency central Heat pump.

Savings Method

Calculated using deemed inputs

Unit

Installed high-efficiency mini-split heat pump system for heating and cooling.

Savings Equation

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Central Heat Pump	1,533.2	0.5800	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Electric kWh Note: Updated based on historic measure mix.

Electric kW Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Central Heat Pump	15	1.00	1.00		1.00	1.00	1.00	0.35	0.53

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Central Heat Pump	35.10%	45.80%	10.10%	9.00%

Measure Life Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

SPF Note: Savings persistence is assumed to be 100%.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Central Heat Pump	0.00	0.00	8.11	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Central Heat Pump	0.34	0.22	0.00	0.88

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

TRC: $689.00 / measure

Incentive: $350.00 / measure

CoolSmart AC QIV ES

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** HVAC O&M | **Measure Sub Type:** Central AC Quality Install

Program: A02b Energy Star HVAC

Measure Description

The verification of proper charge and airflow during installation of new Central AC system.

Baseline Description

The baseline efficiency case is a cooling system not installed according to manufacturer specifications.

Savings Principle

The high efficiency case is the same cooling system installed according to manufacturer specifications.

Savings Method

Calculated using deemed inputs

Unit

Completed QIV on new AC system

Savings Equation

Gross kWh = Tons × (kBtu/hr per ton) × 1/SEER × Hours_C × %SAVE

Gross kW = Tons × (kBtu/hr per ton) × 1/EER × %SAVE

Where:

Tons = Deemed average equipment capacity: 2.7 tons

12 kBtu/hr per ton = Conversion factor

SEER = Seasonal Energy Efficiency Ratio of existing equipment

Hours_C = Deemed average equivalent full load cooling hours

5%SAVE = Average percent demand reduction; National Grid assumption based on regional PA working groups.

EER = Peak efficiency of existing equipment

Hours: 419.0.

Hours Source: Navigant (2018). Res 1 - MA Residential Electric Load Shape and Baseline Study (Cooling and Heating Season report)

Hours Note: The equivalent full load cooling hours are 360 hours/year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
CoolSmart AC QIV ES	40.3	0.0640	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Electric kWh Note: Updated based on historic measure mix.

Electric kW Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
CoolSmart AC QIV ES	18	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
CoolSmart AC QIV ES	6.60%	3.80%	47.30%	42.20%

Measure Life Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: ADM Associated, Inc. (2009). Residential Central AC Regional Evaluation. Prepared for NSTAR, National Grid, Connecticut Light & Power and United Illuminating.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
CoolSmart AC QIV ES	0.00	0.00	1.53	0

Annual $ Note: MA values

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
CoolSmart AC QIV ES	0.25	0.16	0.00	0.91

NTG Source: The Cadmus Group (2013). 2012 Residential Heating, Water Heating, and Cooling Equipment Evaluation: Net-to-Gross, Market Effects, and Equipment Replacement Timing.

TRC: $130.00 / measure

Incentive: $175.00 / measure

CoolSmart HP Digital Check

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** HVAC O&M | **Measure Sub Type:** Heat Pump Tune Up

Program: A02b Energy Star HVAC

Measure Description

Tune-up of an existing heat pump system.

Baseline Description

The baseline efficiency case is a standard residential heat pump system that does not operating according to manufacturer specifications.

Savings Principle

The high efficiency case is the same baseline system but which operates according to manufacturer specifications.

Savings Method

Calculated using deemed inputs

Unit

Completed tune-up of existing heat pump system

Savings Equation

Gross kWh = Tons × (kBtu/hr per ton) × (1/SEER × Hours_C + 1/HSPF × Hours_H) × %SAVE

Gross kW = Tons × (kBtu/hr per ton) × max[(1/EER),(1/HSPF)] × %SAVE

Where:

Tons = Deemed average equipment capacity: 2.6 tons

12 kBtu/hr per ton = Conversion factor

SEER= Seasonal Energy Efficiency Ratio of existing equipment

HSPF = Heating efficiency of existing equipment

Hours_C = Deemed average equivalent full load cooling hours

Hours_H = Deemed average equivalent full load heating hours

5%SAVE = Average percent demand reduction; National Grid assumption based on regional PA working groups.

EER = Peak efficiency of existing equipment

Hours: N/A.

Hours Source: ADM Associated, Inc. (2009). Residential Central AC Regional Evaluation. Prepared for NSTAR, National Grid, Connecticut Light & Power and United Illuminating.

Hours Note: Equivalent full load hours are 1200 hours/year for heating and 360 hours/year for cooling

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
CoolSmart HP Digital Check	341.9	0.1240	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Electric kWh Note: Updated based on historic measure mix.

Electric kW Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Electric kW Note: Updated based on historic measure mix.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
CoolSmart HP Digital Check	5	1.00	1.00		1.00	1.00	1.00	0.26	0.62

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
CoolSmart HP Digital Check	35.10%	45.80%	10.10%	9.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFsp Note: Massachusetts Common Assumption

CFwp Source: Navigant Consulting (2018). Baseline Loadshape StudyCFwp Note: Massachusetts Common Assumption

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
CoolSmart HP Digital Check	0.00	0.00	1.53	0

Annual $ Note: MA values

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
CoolSmart HP Digital Check	0.15	0.00	0.00	0.85

NTG Note: Massachusetts Common Assumption

TRC: $175.00 / measure

Incentive: $175.00 / measure

CoolSmart HP QIV ES

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** HVAC O&M | **Measure Sub Type:** Heat Pump Quality Install

Program: A02b Energy Star HVAC

Measure Description

The verification of proper charge and airflow during installation of new Heat Pump systems.

Baseline Description

The baseline efficiency case is a heating and cooling system not installed according to manufacturer specifications.

Savings Principle

The high efficiency case is the same heating and cooling system not installed according to manufacturer specifications.

Savings Method

Calculated using deemed inputs

Unit

Completed QIV on new heat pump system

Savings Equation

Gross kWh = Tons × (kBtu/hr per ton) × (1/SEER × Hours_C + 1/HSPF × Hours_H) × %SAVE

Gross kW = Tons × (kBtu/hr per ton) × max[(1/EER),(1/HSPF)] × %SAVE

Where:

Tons = Deemed average equipment capacity: 2.6 tons

12 kBtu/hr per ton = Conversion factor

SEER= Seasonal Energy Efficiency Ratio of existing equipment

HSPF = Heating efficiency of existing equipment

Hours_C = Deemed average equivalent full load cooling hours

Hours_H = Deemed average equivalent full load heating hours

5%SAVE = Average percent demand reduction; National Grid assumption based on regional PA working groups.

EER = Peak efficiency of existing equipment

Hours: N/A.

Hours Note: Equivalent full load hours are 1200 hours/year for heating and 360 hours/year for cooling

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
CoolSmart HP QIV ES	265.6	0.0970	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Electric kWh Note: Updated based on historic measure mix.

Electric kW Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Electric kW Note: Updated based on historic measure mix.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
CoolSmart HP QIV ES	18	1.00	1.00		1.00	1.00	1.00	0.25	0.62

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
CoolSmart HP QIV ES	35.10%	45.80%	10.10%	9.00%

Measure Life Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
CoolSmart HP QIV ES	0.00	0.00	1.53	0

Annual $ Note: MA values

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
CoolSmart HP QIV ES	0.25	0.16	0.00	0.91

NTG Source: The Cadmus Group (2013). 2012 Residential Heating, Water Heating, and Cooling Equipment Evaluation: Net-to-Gross, Market Effects, and Equipment Replacement Timing.

TRC: $200.00 / measure

Incentive: $175.00 / measure

Duct Sealing - 100 CFM Reduction in Leaks 15% of Flow to 5%

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Ducting | **Measure Sub Type:** Duct Insulation

Program: A02b Energy Star HVAC

Measure Description

A 66% reduction in duct leakage from 15% to 5% of supplied CFM.

Baseline Description

The baseline efficiency case is assumes a 15% leakage.

Savings Principle

The high efficiency case is a system with duct leakage reduced by 66% to 5% leakage.

Savings Method

Deemed

Unit

Complete duct sealing job for existing HVAC system

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Duct Sealing - 100 CFM Reduction in Leaks 15% of Flow to 5%	442.0	0.3100	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Navigant (2018) Res 34 Home Energy Services Impact Evaluation

Electric kW Source: Navigant (2018) Res 34 Home Energy Services Impact Evaluation

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Duct Sealing - 100 CFM Reduction in Leaks 15% of Flow to 5%	20	1.00	1.00		1.00	1.00	1.00	0.35	

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Duct Sealing - 100 CFM Reduction in Leaks 15% of Flow to 5%	6.60%	3.80%	47.30%	42.20%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Duct Sealing - 100 CFM Reduction in Leaks 15% of Flow to 5%	0.00	0.00	0.23	0.00

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Duct Sealing - 100 CFM Reduction in Leaks 15% of Flow to 5%	0.25	0.12	0.00	0.87

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

NTG Note: Massachusetts Common Assumption

TRC: $1.00 / linear foot

Incentive: $2.00 / linear foot

ECM Pumps

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Motors | **Measure Sub Type:** ECM Motor

Program: A02b Energy Star HVAC

Measure Description

Heating hot water circulation retrofit projects replacing the existing hot water circulation systems with ECM pumps and zone valves.

Baseline Description

The baseline case is standard efficiency steady-state motor without variable speed capabilities.

Savings Principle

The efficient case is the installation of a pump with an electronically commutated motor (ECM) with variable speed capabilities on a boiler.

Savings Method

Deemed

Unit

Installed ECM circulator pump retrofit project.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
ECM Pumps	75.2	0.0410	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Residential Baseline Study - ECM Pumps (Report has not been finalized)

Electric kW Source: RI_PAs_2021-2023 PLAN Electric H&C Savings Workbook 08-11-2020

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
ECM Pumps	15	1.00	1.00		1.00	1.00	1.00	0.00	0.53

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
ECM Pumps	45.00%	55.00%	0.00%	0.00%

Measure Life Source: The Cadmus Group (2012). Impact Evaluation of the 2011-2012 ECM Circulation Pump Pilot Program.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFwp Source: RI_PAs_2020PLAN Electric H&C Savings Workbook 08-20-2019

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
ECM Pumps	0.00	0.00	0.00	0.00

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
ECM Pumps	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $120.00 / measure

Incentive: $100.00 / measure

Electric Resistance to MSHP

Sector: Residential

Fuel: Electric

Program Type: Prescriptive

Measure Category: HVAC

Measure Type: Heating

Measure Sub Type: Heat Pump Electrification

Program: A02b Energy Star HVAC

Measure Description

The purchase and installation of high efficiency mini-split heat pump system to replace an electric resistance heating system.

Baseline Description

The baseline efficiency case for heating is a residential electric resistance heating system.

The baseline efficiency case for cooling is a residential window AC unit with EER 9.8.

Savings Principle

The high efficiency case is an ENERGY STAR® qualified air-source heat pump.

Savings Method

Deemed

Unit

Installed high-efficiency mini-split heat pump system for heating and cooling.

Savings Equation

Heating Gross kWh = Qty*deltakWh_heating

Cooling Gross kWh = Qty*deltakWh_cooling

Cooling Gross kW = Qty*deltakW

Where:

Qty = Total number of units.

deltakWh_heating = Average annual heating kWh reduction per unit.

deltakWh_cooling = Average annual cooling kWh reduction per unit.

deltakW = Average annual kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Electric Resistance to MSHP	6,549.0	2.8300	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Electric kWh Note: Updated based on historic measure mix.

Electric kW Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Electric Resistance to MSHP	18	1.00	1.00		1.00	1.00	1.00	0.02	0.62

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Electric Resistance to MSHP	42.90%	57.10%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Electric Resistance to MSHP	0.00	0.00	4.21	0.00

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Electric Resistance to MSHP	0.31	0.22	0.00	0.91

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

TRC: $6,650.00 / measure

Incentive: $4,000.00 / measure

HPWH <55 Gallon (Electric)

Sector: Residential

Fuel: Electric

Program Type: Prescriptive

Measure Category: Water Heating

Measure Type: Water Heater

Measure Sub Type: Heat Pump Water Heater

Program: A02b Energy Star HVAC

Measure Description

Installation of a heat pump water heater (HPWH) instead of an electric resistance water heater.

Baseline Description

The baseline efficiency case is a new, standard efficiency electric resistance hot water heater.

Savings Principle

The high efficiency case is a high efficiency heat pump water heater.

Savings Method

Deemed

Unit

Installed heat pump water heater.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
HPWH <55 Gallon (Electric)	1,712.0	0.3400	-0.10	0.00	0.00	-0.50	-0.07

Electric kWh Source: Heat Pump Water Heaters - 2021 Quick Hit Study

Electric kW Source: Water Heater UEF screening_2019-21_revised 2018.09.06

Gas Heat MMBtu Source: Water Heater UEF screening_2019-21_revised 2018.09.06

Oil MMBtu Source: Water Heater UEF screening_2019-21_revised 2018.09.06

Propane MMBtu Source: Water Heater UEF screening_2019-21_revised 2018.09.06

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
HPWH <55 Gallon (Electric)	13	1.00	1.00		1.00	1.00	1.00	0.41	0.75

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
HPWH <55 Gallon (Electric)	39.10%	33.00%	14.90%	13.00%

Measure Life Source: Water Heater UEF screening_2019-21_revised 2018.09.06

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
HPWH <55 Gallon (Electric)	0.00	0.00	0.00	0.00

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
HPWH <55 Gallon (Electric)	0.19	0.12	0.00	0.93

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $1,090.00 / measure

Incentive: $600.00 / measure

HPWH >55 Gallon, UEF 2.70 (Electric)

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Water Heater | **Measure Sub Type:** Heat Pump Water Heater

Program: A02b Energy Star HVAC

Measure Description

Installation of a heat pump water heater (HPWH) instead of an electric resistance water heater.

Baseline Description

The baseline efficiency case is a new, standard efficiency electric resistance hot water heater.

Savings Principle

The high efficiency case is a high efficiency heat pump water heater.

Savings Method

Deemed

Unit

Installed heat pump water heater.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
HPWH >55 Gallon, UEF 2.70 (Electric)	197.0	0.0400	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Heat Pump Water Heaters - 2021 Quick Hit Study

Electric kW Source: Water Heater UEF screening_2019-21_revised 2018.09.06

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
HPWH >55 Gallon, UEF 2.70 (Electric)	13	1.00	1.00		1.00	1.00	1.00	0.41	0.75

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
HPWH >55 Gallon, UEF 2.70 (Electric)	39.10%	33.00%	14.90%	13.00%

Measure Life Source: Water Heater UEF screening_2019-21_revised 2018.09.06

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
HPWH >55 Gallon, UEF 2.70 (Electric)	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
HPWH >55 Gallon, UEF 2.70 (Electric)	0.19	0.12	0.00	0.93

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $660.00 / measure

Incentive: $150.00 / measure

Mini Split Heat Pump QIV

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** HVAC O&M | **Measure Sub Type:** Central AC Quality Install

Program: A02b Energy Star HVAC

Measure Description

The verification of proper charge and airflow during installation of new Central AC system.

Baseline Description

The baseline efficiency case is a cooling system and heating system not installed according to manufacturer specifications.

Savings Principle

The high efficiency case is the same cooling and heating system installed according to manufacturer specifications.

Savings Method

Calculated using deemed inputs

Unit

Completed QIV on new AC system

Savings Equation

Gross kWh = Tons × (kBtu/hr per ton) × 1/SEER × Hours_C × %SAVE

Gross kW = Tons × (kBtu/hr per ton) × 1/EER × %SAVE

Where:

Tons = Deemed average equipment capacity: 2.7 tons

12 kBtu/hr per ton = Conversion factor

SEER = Seasonal Energy Efficiency Ratio of existing equipment

Hours_C = Deemed average equivalent full load cooling hours

5%SAVE = Average percent demand reduction; National Grid assumption based on regional PA working groups.

EER = Peak efficiency of existing equipment

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Mini Split Heat Pump QIV	82.3	0.0290	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Electric kWh Note: Updated based on historic measure mix.

Electric kW Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Electric kW Note: Updated based on historic measure mix.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Mini Split Heat Pump QIV	18	1.00	1.00		1.00	1.00	1.00	0.23	0.62

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Mini Split Heat Pump QIV	36.40%	48.20%	8.00%	7.40%

Measure Life Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Mini Split Heat Pump QIV	0.00	0.00	1.53	0

Annual $ Note: MA values

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Mini Split Heat Pump QIV	0.00	0.00	0.00	1.00

TRC: $200.00 / measure

Incentive: $175.00 / measure

MiniSplit HP

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Heat Pumps | **Measure Sub Type:** Ductless

Program: A02b Energy Star HVAC

Measure Description

The installation of a more efficient rated Ductless MiniSplit system (15 SEER, 10 HSPF).

Baseline Description

The baseline efficiency case is a non- energy efficiency® rated ductless mini split heat pump with SEER 15, HSPF 8.2.

Savings Principle

The high efficiency case is a high-efficiency mini-split Heat pump.

Savings Method

Calculated using deemed inputs

Unit

Installed MiniSplit HP

Savings Equation

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
MiniSplit HP	584.2	0.1700	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Electric kWh Note: Updated based on historic measure mix.

Electric kW Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
MiniSplit HP	18	1.00	1.00		1.00	1.00	1.00	0.27	0.62

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
MiniSplit HP	36.40%	48.20%	8.00%	7.40%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
MiniSplit HP	0.00	0.00	4.21	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
MiniSplit HP	0.34	0.22	0.00	0.88

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

TRC: $689.00 / measure

Incentive: $350.00 / measure

WiFi Programmable Thermostat with Cooling (Gas)

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: A02b Energy Star HVAC

Measure Description

Installation of programmable thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule to meet occupancy needs and minimize redundant HVAC operation.

Baseline Description

The baseline efficiency case is an HVAC system providing space heating without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system providing space heating with a programmable thermostat installed.

Savings Method

Deemed

Unit

Installed programmable thermostat.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Gross MMBtu_Oil = Qty × deltaMMBtu_Oil

Gross MMBtu_Propane = Qty× deltaMMBtu_Propane

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

deltaMMBtu_Oil = Average annual oil reduction per unit

deltaMMBtu_Propane = Average annual propane reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
WiFi Programmable Thermostat with Cooling (Gas)	18.0	0.0300	2.79	0.00	0.00	0.00	0.00

Electric kWh Source: Wi-Fi-Thermostat-Impact-Evaluation-Secondary-Literature-Study_FINAL

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Gas Heat MMBtu Source: MA Smart Thermostat Impact Study (RES 24) - Final Results

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
WiFi Programmable Thermostat with Cooling (Gas)	15	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
WiFi Programmable Thermostat with Cooling (Gas)	6.60%	3.80%	47.30%	42.20%

Measure Life Source: Environmental Protection Agency (2010). Life Cycle Cost Estimate for Programmable Thermostats. Accessed on 10/12/2011.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
WiFi Programmable Thermostat with Cooling (Gas)	0.00	0.00	3.63	0.00

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
WiFi Programmable Thermostat with Cooling (Gas)	0.13	0.12	0.00	0.99

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $265.00 / measure

Incentive: $75.00 / measure

WiFi Programmable Thermostat with Cooling (Oil)

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: A02b Energy Star HVAC

Measure Description

Installation of programmable thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule to meet occupancy needs and minimize redundant HVAC operation.

Baseline Description

The baseline efficiency case is an HVAC system providing space heating without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system providing space heating with a programmable thermostat installed.

Savings Method

Deemed

Unit

Installed programmable thermostat.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Gross MMBtu_Oil = Qty × deltaMMBtu_Oil

Gross MMBtu_Propane = Qty× deltaMMBtu_Propane

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

deltaMMBtu_Oil = Average annual oil reduction per unit

deltaMMBtu_Propane = Average annual propane reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
WiFi Programmable Thermostat with Cooling (Oil)	64.4	0.0500	0.00	0.00	0.00	2.79	0.00

Electric kWh Source: Wi-Fi-Thermostat-Impact-Evaluation-Secondary-Literature-Study_FINAL

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Oil MMBtu Source: MA Smart Thermostat Impact Study (RES 24) - Final Results

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
WiFi Programmable Thermostat with Cooling (Oil)	15	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
WiFi Programmable Thermostat with Cooling (Oil)	6.60%	3.80%	47.30%	42.20%

Measure Life Source: Environmental Protection Agency (2010). Life Cycle Cost Estimate for Programmable Thermostats. Accessed on 10/12/2011.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
WiFi Programmable Thermostat with Cooling (Oil)	0.00	0.00	3.63	0.00

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
WiFi Programmable Thermostat with Cooling (Oil)	0.13	0.12	0.00	0.99

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $265.00 / measure

Incentive: $75.00 / measure

Window - Electric Resistance

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, electric resistance

Program: A02b Energy Star HVAC

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Window - Electric Resistance	131.0	0.1300	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Window - Electric Resistance	14	1.00	1.00		1.00	1.00	1.00	0.33	0.43

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Window - Electric Resistance	45.00%	44.00%	6.00%	5.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Window - Electric Resistance	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Window - Electric Resistance	0.04	0.00	0.00	0.96

NTG Source: MA 2022 TRM

TRC: $251.00 / measure

Incentive: $75.00 / measure

Window - Heat Pump

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, heat pump

Program: A02b Energy Star HVAC

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Window - Heat Pump	69.0	0.0500	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Window - Heat Pump	13	1.00	1.00		1.00	1.00	1.00	0.37	0.22

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Window - Heat Pump	25.00%	29.00%	24.00%	21.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Window - Heat Pump	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Window - Heat Pump	0.04	0.00	0.00	0.96

NTG Source: MA 2022 TRM

TRC: $251.00 / measure

Incentive: $75.00 / measure

Window - Oil

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, oil

Program: A02b Energy Star HVAC

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Window - Oil	7.0	0.0100	0.60	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Gas Heat MMBtu Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Window - Oil	14	1.00	1.00		1.00	1.00	1.00	0.37	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Window - Oil	4.00%	4.00%	50.00%	43.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Window - Oil	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Window - Oil	0.04	0.00	0.00	0.96

NTG Source: MA 2022 TRM

TRC: $251.00 / measure

Incentive: $75.00 / measure

Window - Propane

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, propane

Program: A02b Energy Star HVAC

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Window - Propane	7.0	0.0100	0.60	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Gas Heat MMBtu Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Window - Propane	14	1.00	1.00		1.00	1.00	1.00	0.37	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Window - Propane	4.00%	4.00%	50.00%	43.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Window - Propane	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Window - Propane	0.04	0.00	0.00	0.96

NTG Source: MA 2022 TRM

TRC: $251.00 / measure

Incentive: $75.00 / measure

Aerator, Electric

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Faucet Aerator

Program: A03b Energywise

Measure Description

Installation of a faucet aerator with a flow rate of 1.5 GPM or less on an existing faucet with high flow in a residential setting with service water heated by electricity.

Baseline Description

The baseline efficiency case is the existing faucet aerator with 2.2 GPM or greater flow rate.

Savings Principle

The high efficiency case is a faucet with 1.5 GPM or less installed.

Savings Method

Deemed

Unit

Installed faucet aerator.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Aerator, Electric	28.0	0.0100	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Aerator, Electric	7	0.86	1.00		1.00	1.00	1.00	0.31	0.81

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Aerator, Electric	41.50%	31.40%	15.20%	11.90%

Measure Life Note: Massachusetts Common Assumption

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

ISR Note: For mailed-in faucet aerators, ISR is assumed at 59% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Aerator, Electric	269.00	0.00	0	0

Water/Sewer Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Aerator, Electric	0.27	0.01	0.04	0.78

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $7.00 / unit

Incentive: $7.00 / unit

Aerator, Oil

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Faucet Aerator

Program: A03b Energywise

Measure Description

Installation of a faucet aerator with a flow rate of 1.5 GPM or less on an existing faucet with high flow in a residential setting with service water heated by oil.

Baseline Description

The baseline efficiency case is the existing faucet aerator with 2.2 GPM or greater flow rate.

Savings Principle

The high efficiency case is a faucet with 1.5 GPM or less installed.

Savings Method

Deemed

Unit

Installed faucet aerator.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Aerator, Oil	0.0	0.0000	0.00	0.00	0.00	0.15	0.00

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Oil MMBtu Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Aerator, Oil	7	0.86	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Aerator, Oil	0.00%	0.00%	0.00%	0.00%

Measure Life Note: Massachusetts Common Assumption

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

ISR Note: For mailed-in faucet aerators, ISR is assumed at 59% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Aerator, Oil	269.00	0.00	0	0

Water/Sewer Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Aerator, Oil	0.27	0.01	0.04	0.78

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $7.00 / unit

Incentive: $7.00 / unit

Aerator, Others

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Faucet Aerator

Program: A03b Energywise

Measure Description

Installation of a faucet aerator with a flow rate of 1.5 GPM or less on an existing faucet with high flow in a residential setting with service water heated by propane.

Baseline Description

The baseline efficiency case is the existing faucet aerator with 2.2 GPM or greater flow rate.

Savings Principle

The high efficiency case is a faucet with 1.5 GPM or less installed.

Savings Method

Deemed

Unit

Installed faucet aerator.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Aerator, Others	0.0	0.0000	0.00	0.00	0.00	0.00	0.14

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Propane MMBtu Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Aerator, Others	7	0.86	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Aerator, Others	0.00%	0.00%	0.00%	0.00%

Measure Life Note: Massachusetts Common Assumption

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

ISR Note: For mailed-in faucet aerators, ISR is assumed at 59% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Aerator, Others	269.00	0.00	0	0

Water/Sewer Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Aerator, Others	0.27	0.01	0.04	0.78

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $7.00 / unit

Incentive: $7.00 / unit

Air Sealing Kit, Electric

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Air Sealing | **Measure Sub Type:** Air Sealing/Infiltration

Program: A03b Energywise

Measure Description

The installation of recessed lighting cans that provide air sealing benefits.

Baseline Description

The baseline is leaky recessed lighting cans.

Savings Principle

The high efficiency case is the existing building after the air sealing measure is implemented.

Savings Method

Deemed

Unit

Installed kit

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Air Sealing Kit, Electric	94.0	0.0710	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2019 Impact Evaluation of the Home Energy Reports Program

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Air Sealing Kit, Electric	12	1.00	1.00		1.00	1.00	1.00	0.34	0.21

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Air Sealing Kit, Electric	26.10%	30.50%	22.50%	20.80%

Measure Life Source: Rise Engineering (2015). Memo on Pilot Findings for LED inserts for Recessed Light Cans.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Air Sealing Kit, Electric	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Air Sealing Kit, Electric	0.00	0.00	0.04	1.00

NTG Source: The Cadmus Group, Inc (2008). EnergyWise 2008 Program Evaluation.

Air Sealing Kit, Oil

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Air Sealing | **Measure Sub Type:** Air Sealing/Infiltration

Program: A03b Energywise

Measure Description

The installation of recessed lighting cans that provide air sealing benefits.

Baseline Description

The baseline is leaky recessed lighting cans.

Savings Principle

The high efficiency case is the existing building after the air sealing measure is implemented.

Savings Method

Deemed

Unit

Installed kit

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Air Sealing Kit, Oil	0.0	0.0000	0.00	0.00	0.00	0.38	0.00

Oil MMBtu Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Oil MMBtu Note: Calculated: (cfm50 pre in - cfm50 new in)/(18.5* height factor in) * 0.018 * 24 * 60* heating degree day in / seasonal efficiency in * correction factor in

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Air Sealing Kit, Oil	12	1.00	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Air Sealing Kit, Oil	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Rise Engineering (2015). Memo on Pilot Findings for LED inserts for Recessed Light Cans.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Air Sealing Kit, Oil	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Air Sealing Kit, Oil	0.00	0.00	0.04	1.04

NTG Source: The Cadmus Group, Inc (2008). EnergyWise 2008 Program Evaluation.

Air Sealing Kit, Others

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Air Sealing | **Measure Sub Type:** Air Sealing/Infiltration

Program: A03b Energywise

Measure Description

The installation of recessed lighting cans that provide air sealing benefits.

Baseline Description

The baseline is leaky recessed lighting cans.

Savings Principle

The high efficiency case is the existing building after the air sealing measure is implemented.

Savings Method

Deemed

Unit

Installed kit

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Air Sealing Kit, Others	0.0	0.0000	0.00	0.00	0.00	0.00	0.37

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Propane MMBtu Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Air Sealing Kit, Others	12	1.00	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Air Sealing Kit, Others	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Rise Engineering (2015). Memo on Pilot Findings for LED inserts for Recessed Light Cans.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Air Sealing Kit, Others	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Air Sealing Kit, Others	0.00	0.00	0.04	1.00

NTG Source: The Cadmus Group, Inc (2008). EnergyWise 2008 Program Evaluation.

Electric Resistance to MSHP

Sector: Residential

Fuel: Electric

Program Type: Prescriptive

Measure Category: HVAC

Measure Type: Heating

Measure Sub Type: Heat Pump Electrification

Program: A03b Energywise

Measure Description

The purchase and installation of high efficiency mini-split heat pump system to replace an electric resistance heating system.

Baseline Description

The baseline efficiency case for heating is a residential electric resistance heating system.

The baseline efficiency case for cooling is a residential window AC unit with EER 9.8.

Savings Principle

The high efficiency case is an ENERGY STAR® qualified air-source heat pump.

Savings Method

Deemed

Unit

Installed high-efficiency mini-split heat pump system for heating and cooling.

Savings Equation

Heating Gross kWh = Qty*deltakWh_heating

Cooling Gross kWh = Qty*deltakWh_cooling

Cooling Gross kW = Qty*deltakW

Where:

Qty = Total number of units.

deltakWh_heating = Average annual heating kWh reduction per unit.

deltakWh_cooling = Average annual cooling kWh reduction per unit.

deltakW = Average annual kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Electric Resistance to MSHP	6,549.0	2.8300	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Electric kWh Note: Updated based on historic measure mix.

Electric kW Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Electric Resistance to MSHP	18	1.00	1.00		1.00	1.00	1.00	0.02	0.62

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Electric Resistance to MSHP	42.90%	57.10%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Electric Resistance to MSHP	0.00	0.00	4.21	0.00

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Electric Resistance to MSHP	0.31	0.22	0.04	0.91

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

TRC: $7,000.00 / measure

Incentive: $4,200.00 / measure

LED Bulbs

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** LED Screw Base

Program: A03b Energywise

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LED offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly

longer lamp lifetimes.

Baseline Description

The baseline efficiency case is a combination of an incandescent bulb and halogen bulb

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED bulb.

Savings Method

Deemed

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
LED Bulbs	18.0	0.0050	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
LED Bulbs	1	0.95	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
LED Bulbs	35.10%	30.70%	19.00%	15.10%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

ISR Note: For mailed-in LEDs, ISR is assumed at 83% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
LED Bulbs	0.00	0.00	0	3.00

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

One-time $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
LED Bulbs	0.00	0.00	0.04	1.04

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $3.00 / unit

Incentive: $3.00 / unit

LED Bulbs (EISA Exempt)

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** LED Screw Base

Program: A03b Energywise

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly longer lamp lifetimes.

Baseline Description

The baseline efficiency case is a combination of an incandescent bulb and halogen bulb

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED bulb.

Savings Method

Deemed

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
LED Bulbs (EISA Exempt)	15.0	0.0040	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
LED Bulbs (EISA Exempt)	1	0.95	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
LED Bulbs (EISA Exempt)	35.10%	30.70%	19.00%	15.10%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

ISR Note: For mailed-in LEDs, ISR is assumed at 83% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
LED Bulbs (EISA Exempt)	0.00	0.00	0	3.00

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

One-time $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
LED Bulbs (EISA Exempt)	0.00	0.00	0.04	1.04

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

LED Bulbs Reflectors

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** LED Screw Base

Program: A03b Energywise

Measure Description

The installation of Light-Emitting Diode (LED) reflectors. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly

longer lamp lifetimes.

Baseline Description

The baseline efficiency case is a combination of an incandescent bulb and halogen bulb

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED bulb.

Savings Method

Deemed

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
LED Bulbs Reflectors	19.0	0.0050	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
LED Bulbs Reflectors	1	0.95	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
LED Bulbs Reflectors	35.10%	30.70%	19.00%	15.10%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

ISR Note: For mailed-in LEDs, ISR is assumed at 83% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
LED Bulbs Reflectors	0.00	0.00	0	3.00

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

One-time $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
LED Bulbs Reflectors	0.00	0.00	0.04	1.04

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

LED Fixture

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** LED Fixture

Program: A03b Energywise

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly longer lamp lifetimes.

Baseline Description

The baseline efficiency case is a combination of an incandescent bulb and halogen bulb

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED fixture.

Savings Method

Deemed

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
LED Fixture	34.0	0.0090	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
LED Fixture	1	0.95	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
LED Fixture	35.10%	30.70%	19.00%	15.10%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

ISR Note: For mailed-in LEDs, ISR is assumed at 83% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
LED Fixture	0.00	0.00	0	3.50

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

One-time $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
LED Fixture	0.00	0.00	0.04	1.04

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

LED Outdoor Fixture

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Lighting | **Measure Type:** Exterior | **Measure Sub Type:** LED Screw Base

Program: A03b Energywise

Measure Description

The installation of Light-Emitting Diode (LED) outdoor fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly

longer lamp lifetimes.

Baseline Description

The baseline efficiency case is a combination of an incandescent bulb and halogen bulb

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED fixture.

Savings Method

Deemed

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
LED Outdoor Fixture	34.0	0.0090	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
LED Outdoor Fixture	1	0.95	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
LED Outdoor Fixture	35.10%	30.70%	19.00%	15.10%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

ISR Note: For mailed-in LEDs, ISR is assumed at 83% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
LED Outdoor Fixture	0.00	0.00	0	3.50

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

One-time $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
LED Outdoor Fixture	0.00	0.00	0.04	1.04

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Participant

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Participant | **Measure Type:** Participant | **Measure Sub Type:** Participant

Program: A03b Energywise

Measure Description

This row identifies a participant for tracking and cost purposes.

Baseline Description

Savings Principle

Savings Method

Deemed

Unit

Per participant

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Participant	0.0	0.0000	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Participant	11	1.00	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Participant	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Participant	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Participant	0.00	0.00	0.04	1.04

NTG Source: The Cadmus Group, Inc (2008). EnergyWise 2008 Program Evaluation.

TRC: $375.00 / participant

Incentive: $375.00 / participant

Pipe Insulation, Electric

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Insulation | **Measure Sub Type:** Pipe Insulation

Program: A03b Energywise

Measure Description

Insulation upgrades to existing water heating system pipes.

Baseline Description

The baseline case is uninsulated heated water pipes.

Savings Principle

The high efficiency case includes pipe wrap.

Savings Method

Deemed

Unit

Insulated equipment

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Pipe Insulation, Electric	46.0	0.0100	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Pipe Insulation, Electric	7	0.98	1.00		1.00	1.00	1.00	0.31	0.81

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Pipe Insulation, Electric	41.50%	31.40%	15.20%	11.90%

Measure Life Note: Massachusetts Common Assumption

ISR Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Pipe Insulation, Electric	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Pipe Insulation, Electric	0.27	0.01	0.04	0.78

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $7.00 / unit

Incentive: $7.00 / unit

Pipe Insulation, Oil

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Insulation | **Measure Sub Type:** Pipe Insulation

Program: A03b Energywise

Measure Description

Insulation upgrades to existing water heating system pipes.

Baseline Description

The baseline case is uninsulated heated water pipes.

Savings Principle

The high efficiency case includes pipe wrap.

Savings Method

Deemed

Unit

Insulated equipment

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Pipe Insulation, Oil	0	0.0000	0.00	0.00	0.00	0.30	0.00

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Oil MMBtu Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Pipe Insulation, Oil	7	0.98	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Pipe Insulation, Oil	0.00%	0.00%	0.00%	0.00%

Measure Life Note: Massachusetts Common Assumption

ISR Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Pipe Insulation, Oil	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Pipe Insulation, Oil	0.27	0.01	0.04	0.78

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $7.00 / unit

Incentive: $7.00 / unit

Pipe Insulation, Others

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Insulation | **Measure Sub Type:** Pipe Insulation

Program: A03b Energywise

Measure Description

Insulation upgrades to existing water heating system pipes.

Baseline Description

The baseline case is uninsulated heated water pipes.

Savings Principle

The high efficiency case includes pipe wrap.

Savings Method

Deemed

Unit

Insulated equipment

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Pipe Insulation, Others	0	0.0000	0.00	0.00	0.00	0.00	0.30

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Propane MMBtu Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Pipe Insulation, Others	7	0.98	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Pipe Insulation, Others	0.00%	0.00%	0.00%	0.00%

Measure Life Note: Massachusetts Common Assumption

ISR Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Pipe Insulation, Others	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Pipe Insulation, Others	0.27	0.01	0.04	0.78

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $7.00 / unit

Incentive: $7.00 / unit

Pre-Weatherization

Sector: Residential

Fuel: Electric

Program Type: Prescriptive

Measure Category: Whole Home

Measure Type: Weatherization

Measure Sub Type: Pre-Weatherization

Program: A03b Energywise

Measure Description

Rebate for customers to improve home to make it ready for Wx install; non-energy related measures such as asbestos removal or remove knob and tube wiring.

Baseline Description

N/A

Savings Principle

Savings Method

N/A

Unit

Rebated Pre-Wx

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Pre-Weatherization	0.0	0.0000	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Pre-Weatherization	1	1.00	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Pre-Weatherization	0.00%	0.00%	0.00%	0.00%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Pre-Weatherization	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Pre-Weatherization	0.00	0.00	0.04	1.04

NTG Source: Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado

TRC: $250.00 / job

Incentive: $250.00 / job

Programmable Thermostat, Electric

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: A03b Energywise

Measure Description

Installation of programmable thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule.

Baseline Description

The baseline efficiency case is an HVAC system without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system with a programmable thermostat installed.

Savings Method

Deemed

Unit

Installed programmable thermostat.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Programmable Thermostat, Electric	222.6	0.1700	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Programmable Thermostat, Electric	19	0.88	1.00		1.00	1.00	1.00	0.34	0.21

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Programmable Thermostat, Electric	26.00%	31.00%	23.00%	21.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

ISR Note: For mailed-in thermostats, ISR is assumed at 59% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Programmable Thermostat, Electric	0.00	0.00	3.63	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Programmable Thermostat, Electric	0.47	0.01	0.04	0.58

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $100.00 / unit

Incentive: $100.00 / unit

Programmable Thermostat, Oil

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: A03b Energywise

Measure Description

Installation of programmable thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule.

Baseline Description

The baseline efficiency case is an HVAC system without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system with a programmable thermostat installed.

Savings Method

Deemed

Unit

Installed programmable thermostat.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Programmable Thermostat, Oil	27.0	0.0400	0.00	0.00	0.00	2.07	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Oil MMBtu Source: MA Smart Thermostat Impact Study (RES 24) - Final Results

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Programmable Thermostat, Oil	19	0.88	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Programmable Thermostat, Oil	7.00%	4.00%	47.00%	42.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

ISR Note: For mailed-in thermostats, ISR is assumed at 59% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Programmable Thermostat, Oil	0.00	0.00	3.63	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Programmable Thermostat, Oil	0.47	0.01	0.04	0.58

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $100.00 / unit

Incentive: $100.00 / unit

Programmable Thermostat, Others

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: A03b Energywise

Measure Description

Installation of programmable thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule.

Baseline Description

The baseline efficiency case is an HVAC system without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system with a programmable thermostat installed.

Savings Method

Deemed

Unit

Installed programmable thermostat.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Programmable Thermostat, Others	27.0	0.0400	0.00	0.00	0.00	0.00	2.07

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Propane MMBtu Source: MA Smart Thermostat Impact Study (RES 24) - Final Results

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Programmable Thermostat, Others	19	0.88	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Programmable Thermostat, Others	7.00%	4.00%	47.00%	42.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

ISR Note: For mailed-in thermostats, ISR is assumed at 59% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Programmable Thermostat, Others	0.00	0.00	3.63	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Programmable Thermostat, Others	0.47	0.01	0.04	0.58

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $100.00 / unit

Incentive: $100.00 / unit

Refrigerator Brush

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Refrigeration | **Measure Type:** Refrigeration O&M | **Measure Sub Type:** Refrigerator Brush

Program: A03b Energywise

Measure Description

The cleaning of refrigerator coils.

Baseline Description

A refrigerator with uncleaned coils.

Savings Principle

A refrigerator with coils cleaned by an auditor.

Savings Method

Deemed

Unit

Per brushed refrigerator coil

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Refrigerator Brush	10.9	0.0020	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: DNV GL RI EnergyWise Single Family Evaluation, July 2016

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Refrigerator Brush	5	1.00	1.00		1.00	1.00	1.00	0.79	0.65

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Refrigerator Brush	29.00%	32.00%	18.00%	21.00%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Refrigerator Brush	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Refrigerator Brush	0.00	0.00	0.04	1.04

NTG Source: The Cadmus Group, Inc (2008). EnergyWise 2008 Program Evaluation.

TRC: $5.00 / unit

Incentive: $5.00 / unit

Showerhead, Electric

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: A03b Energywise

Measure Description

A showerhead with a control that limits flow once water is heated.

Baseline Description

The baseline case is a showerhead with a flow of 2.5 gallons per minute, or for the case of the adapter, a low flow showerhead with flow of 1.5 gpm or less.

Savings Principle

The high efficiency is a low-flow showerhead with a control that limits flow once the water is heated.

Savings Method

Deemed

Unit

Installed showerhead

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Showerhead, Electric	213.0	0.0500	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Showerhead, Electric	15	0.85	1.00		1.00	1.00	1.00	0.31	0.81

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Showerhead, Electric	41.50%	31.40%	15.20%	11.90%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

ISR Note: For mailed-in showerheads, ISR is assumed at 53% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Showerhead, Electric	1565.00	0.00	0	0.03

Water/Sewer Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

One-time $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Showerhead, Electric	0.27	0.01	0.04	0.78

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $30.00 / unit

Incentive: $30.00 / unit

Showerhead, Oil

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: A03b Energywise

Measure Description

A showerhead with a control that limits flow once water is heated.

Baseline Description

The baseline case is a showerhead with a flow of 2.5 gallons per minute, or for the case of the adapter, a low flow showerhead with flow of 1.5 gpm or less.

Savings Principle

The high efficiency is a low-flow showerhead with a control that limits flow once the water is heated.

Savings Method

Deemed

Unit

Installed showerhead

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Showerhead, Oil	0	0	0.00	0.00	0.00	1.20	0.00

Oil MMBtu Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Showerhead, Oil	15	0.85	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Showerhead, Oil	0.00%	0.00%	0.00%	0.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

ISR Note: For mailed-in showerheads, ISR is assumed at 53% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Showerhead, Oil	1565.00	0.00	0	0.03

Water/Sewer Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

One-time $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Showerhead, Oil	0.27	0.01	0.04	0.78

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $30.00 / unit

Incentive: $30.00 / unit

Showerhead, Others

Sector: Residential

Fuel: Electric

Program Type: Prescriptive

Measure Category: Water Heating

Measure Type: Flow Control

Measure Sub Type: Low Flow Showerhead

Program: A03b Energywise

Measure Description

A showerhead with a control that limits flow once water is heated.

Baseline Description

The baseline case is a showerhead with a flow of 2.5 gallons per minute, or for the case of the adapter, a low flow showerhead with flow of 1.5 gpm or less.

Savings Principle

The high efficiency is a low-flow showerhead with a control that limits flow once the water is heated.

Savings Method

Deemed

Unit

Installed showerhead

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Showerhead, Others	0	0	0.00	0.00	0.00	0.00	1.10

Propane MMBtu Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Showerhead, Others	15	0.85	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Showerhead, Others	0.00%	0.00%	0.00%	0.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

ISR Note: For mailed-in showerheads, ISR is assumed at 53% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Showerhead, Others	1565.00	0.00	0	0.03

Water/Sewer Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

One-time $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Showerhead, Others	0.27	0.01	0.04	0.78

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $30.00 / unit

Incentive: $30.00 / unit

Smart Strip

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Plug Load | **Measure Type:** Smart Strips | **Measure Sub Type:** Smart Strip

Program: A03b Energywise

Measure Description

The basic measures switches off plug load using current sensors and switching devices which turn off plug load when electrical current drops below threshold low levels. The advanced measure shuts devices off after it no longer senses activity from their infrared controls.

Baseline Description

The baseline efficiency case is the absence power strip and leaving peripheral devices plugged in or using a power surge protector and leaving peripheral devices on

Savings Principle

The high efficiency case is the use of a smart strip or advanced smart strip.

Savings Method

Deemed

Unit

Rebated smart strip.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Smart Strip	105.0	0.0200	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Smart Strip	5	0.84	1.00		0.92	0.92	0.92	0.58	0.86

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Smart Strip	32.00%	34.80%	15.00%	18.00%

Measure Life Note: Massachusetts Common Assumption

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: NMR (2018). RLPNC 17-3 Smart Power Strip Metering Study

RRsp Source: NMR (2018). RLPNC 17-3 Smart Power Strip Metering Study

RRwp Source: NMR (2018). RLPNC 17-3 Smart Power Strip Metering Study

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Smart Strip	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Smart Strip	0.31	0.01	0.04	0.74

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $22.00 / unit

Incentive: $22.00 / unit

Weatherization, Electric

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Insulation | **Measure Sub Type:** Shell

Program: A03b Energywise

Measure Description

Installation of weatherization measures such as air sealing and insulation upgrades in existing facilities.

Baseline Description

The baseline efficiency case is any existing home shell measures.

Savings Principle

The high efficiency case includes increased weatherization insulation levels.

Savings Method

Deemed

Unit

Completed insulation project.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Weatherization, Electric	840.0	0.6400	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Weatherization, Electric	20	1.00	1.00		1.00	1.00	1.00	0.34	0.21

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Weatherization, Electric	26.00%	31.00%	23.00%	21.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Weatherization, Electric	0.00	0.00	66.59	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Weatherization, Electric	0.14	0.01	0.04	0.91

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $3,700.00 / participant

Incentive: $3,080.00 / participant

Weatherization, Oil

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Insulation | **Measure Sub Type:** Shell

Program: A03b Energywise

Measure Description

Installation of weatherization measures such as air sealing and insulation upgrades in existing facilities.

Baseline Description

The baseline efficiency case is any existing home shell measures.

Savings Principle

The high efficiency case includes increased weatherization insulation levels.

Savings Method

Deemed

Unit

Completed insulation project.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Weatherization, Oil	48.0	0.0800	0.00	0.00	0.00	9.80	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Oil MMBtu Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Weatherization, Oil	20	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Weatherization, Oil	7.00%	4.00%	47.00%	42.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Weatherization, Oil	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Weatherization, Oil	0.14	0.01	0.04	0.91

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $4,700.00 / participant

Incentive: $2,945.00 / participant

Weatherization, Others

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Insulation | **Measure Sub Type:** Shell

Program: A03b Energywise

Measure Description

Installation of weatherization measures such as air sealing and insulation upgrades in existing facilities.

Baseline Description

The baseline efficiency case is any existing home shell measures.

Savings Principle

The high efficiency case includes increased weatherization insulation levels.

Savings Method

Deemed

Unit

Completed insulation project.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Weatherization, Others	48.0	0.0800	0.00	0.00	0.00	0.00	9.60

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Propane MMBtu Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Weatherization, Others	20	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Weatherization, Others	7.00%	4.00%	47.00%	42.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Weatherization, Others	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Weatherization, Others	0.14	0.01	0.04	0.91

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $4,700.00 / participant

Incentive: $2,945.00 / participant

WiFi Thermostat, AC Only

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: A03b Energywise

Measure Description

Installation of wifi thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule to meet occupancy needs and minimize redundant HVAC operation.

Baseline Description

The baseline efficiency case is an HVAC system with either a manual or a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system providing space heating with a wifi thermostat installed.

Savings Method

Deemed

Unit

Installed programmable thermostat.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Gross MMBtu_Oil = Qty × deltaMMBtu_Oil

Gross MMBtu_Propane = Qty× deltaMMBtu_Propane

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

deltaMMBtu_Oil = Average annual oil reduction per unit

deltaMMBtu_Propane = Average annual propane reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
WiFi Thermostat, AC Only	51.0	0.0800	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
WiFi Thermostat, AC Only	15	0.88	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
WiFi Thermostat, AC Only	7.00%	4.00%	47.00%	42.00%

Measure Life Source: Environmental Protection Agency (2010). Life Cycle Cost Estimate for Programmable Thermostats. Accessed on 10/12/2011.

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

ISR Note: For mailed-in thermostats, ISR is assumed at 59% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
WiFi Thermostat, AC Only	0.00	0.00	3.63	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
WiFi Thermostat, AC Only	0.47	0.01	0.04	0.58

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $300.00 / unit

Incentive: $200.00 / unit

WiFi Thermostat, Electric

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: A03b Energywise

Measure Description

Installation of wifi thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule to meet occupancy needs and minimize redundant HVAC operation.

Baseline Description

The baseline efficiency case is an HVAC system with either a manual or a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system providing space heating with a wifi thermostat installed.

Savings Method

Deemed

Unit

Installed programmable thermostat.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Gross MMBtu_Oil = Qty × deltaMMBtu_Oil

Gross MMBtu_Propane = Qty× deltaMMBtu_Propane

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

deltaMMBtu_Oil = Average annual oil reduction per unit

deltaMMBtu_Propane = Average annual propane reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
WiFi Thermostat, Electric	222.6	0.1700	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
WiFi Thermostat, Electric	15	0.88	1.00		1.00	1.00	1.00	0.34	0.21

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
WiFi Thermostat, Electric	26.00%	31.00%	23.00%	21.00%

Measure Life Source: Environmental Protection Agency (2010). Life Cycle Cost Estimate for Programmable Thermostats. Accessed on 10/12/2011.

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

ISR Note: For mailed-in thermostats, ISR is assumed at 59% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
WiFi Thermostat, Electric	0.00	0.00	3.63	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
WiFi Thermostat, Electric	0.47	0.01	0.04	0.58

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $300.00 / unit

Incentive: $200.00 / unit

WiFi Thermostat, Oil

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: A03b Energywise

Measure Description

Installation of wifi thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule to meet occupancy needs and minimize redundant HVAC operation.

Baseline Description

The baseline efficiency case is an HVAC system with either a manual or a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system providing space heating with a wifi thermostat installed.

Savings Method

Deemed

Unit

Installed programmable thermostat.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Gross MMBtu_Oil = Qty × deltaMMBtu_Oil

Gross MMBtu_Propane = Qty× deltaMMBtu_Propane

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

deltaMMBtu_Oil = Average annual oil reduction per unit

deltaMMBtu_Propane = Average annual propane reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
WiFi Thermostat, Oil	27.0	0.0400	0.00	0.00	0.00	2.79	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Oil MMBtu Source: MA Smart Thermostat Impact Study (RES 24) - Final Results

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
WiFi Thermostat, Oil	15	0.88	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
WiFi Thermostat, Oil	7.00%	4.00%	47.00%	42.00%

Measure Life Source: Environmental Protection Agency (2010). Life Cycle Cost Estimate for Programmable Thermostats. Accessed on 10/12/2011.

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

ISR Note: For mailed-in thermostats, ISR is assumed at 59% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
WiFi Thermostat, Oil	0.00	0.00	3.63	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
WiFi Thermostat, Oil	0.47	0.01	0.04	0.58

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $300.00 / unit

Incentive: $200.00 / unit

WiFi Thermostat, Others

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: A03b Energywise

Measure Description

Installation of wifi thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule to meet occupancy needs and minimize redundant HVAC operation.

Baseline Description

The baseline efficiency case is an HVAC system with either a manual or a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system providing space heating with a wifi thermostat installed.

Savings Method

Deemed

Unit

Installed programmable thermostat.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Gross MMBtu_Oil = Qty × deltaMMBtu_Oil

Gross MMBtu_Propane = Qty× deltaMMBtu_Propane

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

deltaMMBtu_Oil = Average annual oil reduction per unit

deltaMMBtu_Propane = Average annual propane reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
WiFi Thermostat, Others	27.0	0.0400	0.00	0.00	0.00	0.00	2.79

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Propane MMBtu Source: MA Smart Thermostat Impact Study (RES 24) - Final Results

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
WiFi Thermostat, Others	15	0.88	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
WiFi Thermostat, Others	7.00%	4.00%	47.00%	42.00%

Measure Life Source: Environmental Protection Agency (2010). Life Cycle Cost Estimate for Programmable Thermostats. Accessed on 10/12/2011.

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

ISR Note: For mailed-in thermostats, ISR is assumed at 59% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
WiFi Thermostat, Others	0.00	0.00	3.63	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
WiFi Thermostat, Others	0.47	0.01	0.04	0.58

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $300.00 / unit

Incentive: $200.00 / unit

Window - Electric Resistance

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, electric resistance

Program: A03b EnergyWise

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Window - Electric Resistance	131.0	0.1300	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Window - Electric Resistance	14	1.00	1.00		1.00	1.00	1.00	0.33	0.43

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Window - Electric Resistance	45.00%	44.00%	6.00%	5.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Window - Electric Resistance	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Window - Electric Resistance	0.04	0.00	0.04	0.96

NTG Source: MA 2022 TRM

Window - Heat Pump

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, heat pump

Program: A03b EnergyWise

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Window - Heat Pump	69.0	0.0500	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Window - Heat Pump	13	1.00	1.00		1.00	1.00	1.00	0.37	0.22

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Window - Heat Pump	25.00%	29.00%	24.00%	21.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Window - Heat Pump	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Window - Heat Pump	0.04	0.00	0.04	0.96

NTG Source: MA 2022 TRM

Window - Oil

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, oil

Program: A03b EnergyWise

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Window - Oil	7.0	0.0100	0.60	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Gas Heat MMBtu Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Window - Oil	14	1.00	1.00		1.00	1.00	1.00	0.37	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Window - Oil	4.00%	4.00%	50.00%	43.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Window - Oil	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Window - Oil	0.04	0.00	0.04	0.96

NTG Source: MA 2022 TRM

Window - Propane

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, propane

Program: A03b EnergyWise

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Window - Propane	7.0	0.0100	0.60	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Gas Heat MMBtu Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Window - Propane	14	1.00	1.00		1.00	1.00	1.00	0.37	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Window - Propane	4.00%	4.00%	50.00%	43.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Window - Propane	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Window - Propane	0.04	0.00	0.04	0.96

NTG Source: MA 2022 TRM

AERATOR Elec

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Faucet Aerator

Program: A03b EnergywiseMF

Measure Description

Installation of a faucet aerator with a flow rate of 1.5 GPM or less on an existing faucet with high flow in a commercial setting with service water heated by electricity.

Baseline Description

The baseline efficiency case is 2.2 GPM or greater faucet.

Savings Principle

The high efficiency case is a faucet with 1.5 GPM or less aerator installed.

Savings Method

Calculated using site-specific inputs

Unit

Installed faucet aerator.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
AERATOR Elec	38.0	0.0091	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
AERATOR Elec	7	0.90	1.00		1.00	1.00	1.00	0.31	0.81

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
AERATOR Elec	41.50%	31.40%	15.20%	11.90%

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
AERATOR Elec	359.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
AERATOR Elec	0.08	0.01	0.00	0.93

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

AERATOR Oil

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Faucet Aerator

Program: A03b EnergywiseMF

Measure Description

Installation of a faucet aerator with a flow rate of 1.5 GPM or less on an existing faucet with high flow in a commercial setting with service water heated by electricity.

Baseline Description

The baseline efficiency case is 2.2 GPM or greater faucet.

Savings Principle

The high efficiency case is a faucet with 1.5 GPM or less aerator installed.

Savings Method

Deemed

Unit

Installed faucet aerator.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
AERATOR Oil	0	0	0.00	0.00	0.00	0.20	0.00

Oil MMBtu Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
AERATOR Oil	7	0.90	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
AERATOR Oil	0.00%	0.00%	0.00%	0.00%

Measure Life Note: National Grid assumption based on regional PA working groups.

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
AERATOR Oil	359.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
AERATOR Oil	0.08	0.01	0.00	0.93

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

AIR SEALING ELEC WITH AC

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Building Shell | **Measure Type:** Air Sealing | **Measure Sub Type:** Electric with AC

Program: A03b EnergywiseMF

Measure Description

Thermal shell air leaks are sealed through strategic use and location of air-tight materials.

Baseline Description

The baseline efficiency case is the existing building before the air sealing measure is implemented. The baseline building is characterized by the existing CFM50 measurement (CFM50PRE) for single family homes, or the existing air changes per hour (ACHPRE)

Savings Principle

The high efficiency case is the existing building after the air sealing measure is implemented. The high efficiency building is characterized by the new CFM50 measurement for single family homes (CFM50POST), or the new air changes per hour (ACHPOST) for multi-family facilities, which is measured after the air sealing measure is implemented.

Savings Method

Calculated using site-specific inputs

Unit

Completed air sealing project.

Savings Equation

Gross kWh = Stories × SQFT × (CFM/SQFT_pre - CFM/SQFT_post) × deltakWh/CFM

Gross kW = Gross kWh × kW/kWh

Where:

Stories = Total stories in the multi-family building

SQFT = Area of building in square feet

CFM/SQFT_pre = Estimate of pre-retrofit air leakagein CFM/SQFT based on number of stories in the building and air-tightness ratings of the existing roof and floor

CFM/SQFT_post = Estimate of post-retrofit air leakage in CFM/SQFT based on number of stories in the building and air-tightness ratings of theimproved roof and floor

deltakWh/CFM = Average annual kWh reduction per CFM

Gross kWh = Stories × SQFT × (CFM/SQFT_pre - CFM/SQFT_post) × deltakWh/CFM

kW/kWh = Average kW reduction per kWh reduction

Hours: 4,644.0.

Hours Source: NOAA Weather data: An average BASE 60 Annual Heating Degree Day value for weather stations in Rhode Island and southeastern Massachusetts based on NOAA 30-year data.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
AIR SEALING ELEC WITH AC	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
AIR SEALING ELEC WITH AC	20	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
AIR SEALING ELEC WITH AC	6.59%	3.85%	47.32%	42.24%

Measure Life Source: 'ComEd Effective Useful Life Research Report', May 2018

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
AIR SEALING ELEC WITH AC	0.00	0.00	19.35	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
AIR SEALING ELEC WITH AC	0.33	0.01	0.00	0.68

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

AIR SEALING OIL

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Building Shell | **Measure Type:** Air Sealing | **Measure Sub Type:** Oil

Program: A03b EnergywiseMF

Measure Description

Thermal shell air leaks are sealed through strategic use and location of air-tight materials.

Baseline Description

The baseline efficiency case is the existing building before the air sealing measure is implemented. The baseline building is characterized by the existing CFM50 measurement (CFM50PRE) for single family homes, or the existing air changes per hour (ACHPRE)

Savings Principle

The high efficiency case is the existing building after the air sealing measure is implemented. The high efficiency building is characterized by the new CFM50 measurement for single family homes (CFM50POST), or the new air changes per hour (ACHPOST) for multi-family facilities, which is measured after the air sealing measure is implemented.

Savings Method

Calculated using site-specific inputs

Unit

Completed air sealing project.

Savings Equation

Gross kWh = Stories × SQFT × (CFM/SQFT_pre - CFM/SQFT_post) × deltakWh/CFM

Gross kW = Gross kWh × kW/kWh

Where:

Stories = Total stories in the multi-family building

SQFT = Area of building in square feet

CFM/SQFT_pre = Estimate of pre-retrofit air leakagein CFM/SQFT based on number of stories in the building and air-tightness ratings of the existing roof and floor

CFM/SQFT_post = Estimate of post-retrofit air leakage in CFM/SQFT based on number of stories in the building and air-tightness ratings of theimproved roof and floor

deltakWh/CFM = Average annual kWh reduction per CFM

Gross kWh = Stories × SQFT × (CFM/SQFT_pre - CFM/SQFT_post) × deltakWh/CFM

kW/kWh = Average kW reduction per kWh reduction

Hours: 4,644.0.

Hours Source: NOAA Weather data: An average BASE 60 Annual Heating Degree Day value for weather stations in Rhode Island and southeastern Massachusetts based on NOAA 30-year data.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
AIR SEALING OIL	Calc	Calc	0.00	0.00	0.00	Calc	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Oil MMBtu Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
AIR SEALING OIL	20	1.00	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
AIR SEALING OIL	0.00%	0.00%	0.00%	0.00%

Measure Life Source: 'ComEd Effective Useful Life Research Report', May 2018

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
AIR SEALING OIL	0.00	0.00	19.35	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
AIR SEALING OIL	0.33	0.01	0.00	0.68

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Common Ext LED Bulb

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Lighting | **Measure Type:** Exterior | **Measure Sub Type:** Common LED

Program: A03b EnergywiseMF

Measure Description

The installation of ENERGY STAR® LED outdoor bulbs.

Baseline Description

The baseline efficiency case is the existing installed bulb.

Savings Principle

The high efficiency case is bulbs that use fewer watts.

Savings Method

Deemed

Unit

Installed bulb

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Common Ext LED Bulb	162.0	0.0405	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Common Ext LED Bulb	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Common Ext LED Bulb	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Navigant (2018). Multi-Family Program Impact and Net-to-Gross Evaluation (RES 44). Prepared for the MA Program Administrators.

SPF Note: Savings persistence is assumed to be 100%.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Common Ext LED Bulb	0.00	0.00	14.12	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Common Ext LED Bulb	0.23	0.01	0.00	0.78

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Common Ext LED Fixture

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Exterior | **Measure Sub Type:** Common LED

Program: A03b EnergywiseMF

Measure Description

The installation of ENERGY STAR® compact fluorescent (CFL) indoor fixtures. Compact fluorescent fixtures offer comparable luminosity to incandescent fixtures at significantly

less wattage and significantly longer lifetimes. Hardwired fluorescent fixturesoffer comparable luminosity to incandescent fixtures at significantly lower wattage and offer significantly longer lifespan.

Baseline Description

The baseline efficiency case is the existing lighting hours of use.

Savings Principle

The high efficiency case is lights that are using fewer hours, reducing energy.

Savings Method

Calculated using site-specific inputs

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Note: Multifamily common area hours are site specific

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Common Ext LED Fixture	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Common Ext LED Fixture	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Common Ext LED Fixture	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Navigant (2018). Multi-Family Program Impact and Net-to-Gross Evaluation (RES 44). Prepared for the MA Program Administrators.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Common Ext LED Fixture	0.00	0.00	14.12	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Common Ext LED Fixture	0.23	0.01	0.00	0.78

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Common Ext Reflector

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Exterior | **Measure Sub Type:** Common Reflector

Program: A03b EnergywiseMF

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly longer lamp lifetimes.

Baseline Description

The baseline efficiency case is blend of incandescent, halogens, CFLs and other bulbs types, as provided by market research or for EISA exempt bulbs and bulbs installed through an home energy audit, the base line is a 65 Watt incandescent.

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED fixture.

Savings Method

Deemed

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Note: Multifamily common area hours are site specific

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Common Ext Reflector	210.0	0.0525	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Common Ext Reflector	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Common Ext Reflector	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Navigant (2018). Multi-Family Program Impact and Net-to-Gross Evaluation (RES 44). Prepared for the MA Program Administrators.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Common Ext Reflector	0.00	0.00	14.12	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Common Ext Reflector	0.23	0.01	0.00	0.78

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Common Int EISA Exempt

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** Common EISA

Program: A03b EnergywiseMF

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly longer lamp lifetimes.

Baseline Description

The baseline efficiency case is blend of incandescent, halogens, CFLs and other bulbs types, as provided by market research or for EISA exempt bulbs and bulbs installed through an home energy audit, the base line is a 65 Watt incandescent.

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED fixture.

Savings Method

Deemed

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Note: Multifamily common area hours are site specific

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Common Int EISA Exempt	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Common Int EISA Exempt	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Common Int EISA Exempt	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Navigant (2018). Multi-Family Program Impact and Net-to-Gross Evaluation (RES 44). Prepared for the MA Program Administrators.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Common Int EISA Exempt	0.00	0.00	14.12	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Common Int EISA Exempt	0.23	0.01	0.00	0.78

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Common Int LED Bulbs

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** Common LED

Program: A03b EnergywiseMF

Measure Description

The installation of ENERGY STAR® LED indoor bulbs.

Baseline Description

The baseline efficiency case is the existing installed bulb.

Savings Principle

The high efficiency case is bulbs that use fewer watts.

Savings Method

Deemed

Unit

Installed bulb

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Common Int LED Bulbs	179.0	0.0448	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Common Int LED Bulbs	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Common Int LED Bulbs	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Navigant (2018). Multi-Family Program Impact and Net-to-Gross Evaluation (RES 44). Prepared for the MA Program Administrators.

SPF Note: Savings persistence is assumed to be 100%.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Common Int LED Bulbs	0.00	0.00	14.12	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Common Int LED Bulbs	0.23	0.01	0.00	0.78

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Common Int LED Fixture

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** Common LED

Program: A03b EnergywiseMF

Measure Description

The installation of ENERGY STAR® compact fluorescent (CFL) indoor fixtures. Compact fluorescent fixtures offer comparable luminosity to incandescent fixtures at significantly

less wattage and significantly longer lifetimes. Hardwired fluorescent fixturesoffer comparable luminosity to incandescent fixtures at significantly lower wattage and offer significantly longer lifespan.

Baseline Description

The baseline efficiency case is a blend of incandescent, compact fluorescent, and halogen lamps. For home audit applications, the baseline is the existing fixture.

Savings Principle

The high efficiency case is an ENERGY STAR® qualified compact fluorescent light fixture wired for exclusive use with pin-based CFLs.

Savings Method

Deemed

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Note: Multifamily common area hours are site specific

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Common Int LED Fixture	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Common Int LED Fixture	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Common Int LED Fixture	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Navigant (2018). Multi-Family Program Impact and Net-to-Gross Evaluation (RES 44). Prepared for the MA Program Administrators.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Common Int LED Fixture	0.00	0.00	14.12	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Common Int LED Fixture	0.23	0.01	0.00	0.78

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Common Int Reflector

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** Common Reflector

Program: A03b EnergywiseMF

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly longer lamp lifetimes.

Baseline Description

The baseline efficiency case is blend of incandescent, halogens, CFLs and other bulbs types, as provided by market research or for EISA exempt bulbs and bulbs installed through an home energy audit, the base line is a 65 Watt incandescent.

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED fixture.

Savings Method

Deemed

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Source: NMR Group, Northeast Residential Lighting Hours-of-Use Study, May 2014

Hours Note: Multifamily common area hours are site specific

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Common Int Reflector	140.0	0.0350	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Common Int Reflector	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Common Int Reflector	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Navigant (2018). Multi-Family Program Impact and Net-to-Gross Evaluation (RES 44). Prepared for the MA Program Administrators.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Common Int Reflector	0.00	0.00	14.12	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Common Int Reflector	0.23	0.01	0.00	0.78

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Custom

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Custom | **Measure Sub Type:** Custom

Program: A03b EnergywiseMF

Measure Description

Vendors install a variety of measures at multifamily facilities; includes all custom multifamily measures.

Baseline Description

For retrofit projects, the baseline efficiency case is the same as the existing, or pre-retrofit, case for the custom multifamily measures.

Savings Principle

The high efficiency scenario is specific to the facility and may include one or more energy efficiency custom non-lighting multifamily measures.

Savings Method

Calculated using site-specific inputs

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Custom	Calc	Calc	0.00	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Custom	multi	1.00	1.00		0.86	0.86	0.86	0.58	0.43

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Custom	43.13%	56.87%	0.00%	0.00%

SPF Note: Savings persistence is assumed to be 100%.

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Custom	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Custom	0.00	0.00	0.00	1.00

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Dwelling Ext LED Fixture

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Exterior | **Measure Sub Type:** Dwelling LED

Program: A03b EnergywiseMF

Measure Description

The installation of ENERGY STAR® compact fluorescent (CFL) indoor fixtures. Compact fluorescent fixtures offer comparable luminosity to incandescent fixtures at significantly

less wattage and significantly longer lifetimes. Hardwired fluorescent fixturesoffer comparable luminosity to incandescent fixtures at significantly lower wattage and offer significantly longer lifespan.

Baseline Description

The baseline efficiency case is a blend of incandescent, compact fluorescent, and halogen lamps. For home audit applications, the baseline is the existing fixture.

Savings Principle

The high efficiency case is an ENERGY STAR® qualified compact fluorescent light fixture wired for exclusive use with pin-based CFLs.

Savings Method

Calculated using site-specific inputs

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Source: NMR Group, Northeast Residential Lighting Hours-of-Use Study, May 2014

Hours Note: Multifamily dwelling unit hours defined by room type from NMR HOU study.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dwelling Ext LED Fixture	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dwelling Ext LED Fixture	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dwelling Ext LED Fixture	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dwelling Ext LED Fixture	0.00	0.00	0	3.50

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dwelling Ext LED Fixture	0.00	0.00	0.00	1.00

NTG Source: The Cadmus Group, Inc (2008). EnergyWise 2008 Program Evaluation.

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Dwelling Ext Reflector

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Exterior | **Measure Sub Type:** Dwelling Reflector

Program: A03b EnergywiseMF

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly longer lamp lifetimes.

Baseline Description

The baseline efficiency case is blend of incandescent, halogens, CFLs and other bulbs types, as provided by market research or for EISA exempt bulbs and bulbs installed through an home energy audit, the base line is a 65 Watt incandescent.

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED fixture.

Savings Method

Deemed

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Note: Multifamily dwelling unit hours defined by room type from NMR HOU study.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dwelling Ext Reflector	19.0	0.0048	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dwelling Ext Reflector	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dwelling Ext Reflector	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dwelling Ext Reflector	0.00	0.00	0	3.00

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dwelling Ext Reflector	0.00	0.00	0.00	1.00

NTG Source: The Cadmus Group, Inc (2008). EnergyWise 2008 Program Evaluation.

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Dwelling Int EISA Exempt

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** Dwelling EISA

Program: A03b EnergywiseMF

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly longer lamp lifetimes.

Baseline Description

The baseline efficiency case is blend of incandescent, halogens, CFLs and other bulbs types, as provided by market research or for EISA exempt bulbs and bulbs installed through an home energy audit, the base line is a 65 Watt incandescent.

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED fixture.

Savings Method

Deemed

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Source: NMR Group, Northeast Residential Lighting Hours-of-Use Study, May 2014

Hours Note: Multifamily dwelling unit hours defined by room type from NMR HOU study.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dwelling Int EISA Exempt	15.0	0.0038	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dwelling Int EISA Exempt	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dwelling Int EISA Exempt	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dwelling Int EISA Exempt	0.00	0.00	0	3.00

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dwelling Int EISA Exempt	0.00	0.00	0.00	1.00

NTG Source: The Cadmus Group, Inc (2008). EnergyWise 2008 Program Evaluation.

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Dwelling Int LED Bulbs

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** Dwelling LED

Program: A03b EnergywiseMF

Measure Description

The installation of ENERGY STAR® LED indoor bulbs.

Baseline Description

The baseline efficiency case is the existing installed bulb.

Savings Principle

The high efficiency case is bulbs that use fewer watts.

Savings Method

Deemed

Unit

Installed bulb

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dwelling Int LED Bulbs	18.0	0.0045	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dwelling Int LED Bulbs	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dwelling Int LED Bulbs	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

SPF Note: Savings persistence is assumed to be 100%.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dwelling Int LED Bulbs	0.00	0.00	0	3.50

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dwelling Int LED Bulbs	0.00	0.00	0.00	1.00

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Dwelling Int LED Fixture

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** Dwelling LED

Program: A03b EnergywiseMF

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly longer lamp lifetimes.

Baseline Description

The baseline efficiency case is blend of incandescent, CFLs and other bulbs types, as provided by market research or for a home energy audit, the base line is a 65 Watt incandescent.

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED fixture.

Savings Method

Calculated using site-specific inputs

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Source: NMR Group, Northeast Residential Lighting Hours-of-Use Study, May 2014

Hours Note: Multifamily dwelling unit hours defined by room type from NMR HOU study.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dwelling Int LED Fixture	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dwelling Int LED Fixture	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dwelling Int LED Fixture	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dwelling Int LED Fixture	0.00	0.00	0	3.50

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dwelling Int LED Fixture	0.00	0.00	0.00	1.00

NTG Source: The Cadmus Group, Inc (2008). EnergyWise 2008 Program Evaluation.

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Dwelling Int Reflector

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** Dwelling Reflector

Program: A03b EnergywiseMF

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly longer lamp lifetimes.

Baseline Description

The baseline efficiency case is blend of incandescent, halogens, CFLs and other bulbs types, as provided by market research or for EISA exempt bulbs and bulbs installed through an home energy audit, the base line is a 65 Watt incandescent.

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED fixture.

Savings Method

Deemed

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Source: NMR Group, Northeast Residential Lighting Hours-of-Use Study, May 2014

Hours Note: Multifamily dwelling unit hours defined by room type from NMR HOU study.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dwelling Int Reflector	19.0	0.0048	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dwelling Int Reflector	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dwelling Int Reflector	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dwelling Int Reflector	0.00	0.00	0	3.00

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dwelling Int Reflector	0.00	0.00	0.00	1.00

NTG Source: The Cadmus Group, Inc (2008). EnergyWise 2008 Program Evaluation.

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Heating System Retrofit-Boiler

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Heating | **Measure Sub Type:** Retrofit Boiler

Program: A03b EnergywiseMF

Measure Description

The installation of high efficiency heating systems.

Baseline Description

The baseline is the existing heating system.

Savings Principle

The high efficiency case includes replacing heating systems with higher efficiency systems.

Savings Method

Calculated using site-specific inputs

Unit

Installed high-efficiency heating system.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Gross MMBtu_Oil = Qty × deltaMMBtu_Oil

Gross MMBtu_Propane = Qty× deltaMMBtu_Propane

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

deltaMMBtu_Oil = Average annual oil reduction per unit

deltaMMBtu_Propane = Average annual propane reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heating System Retrofit-Boiler	0	0	0.00	0.00	0.00	20.40	0.00

Oil MMBtu Source: The Cadmus Group, Inc. (2012). Low Income Single Family Impact Evaluation. Prepared for the Electric and Gas Program Administrators of Massachusetts.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heating System Retrofit-Boiler	23	1.00	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heating System Retrofit-Boiler	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

CFwp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heating System Retrofit-Boiler	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heating System Retrofit-Boiler	0.00	0.00	0.00	1.00

NTG Source: The Cadmus Group, Inc (2008). EnergyWise 2008 Program Evaluation.

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Heating System Retrofit-Furnace

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Heating | **Measure Sub Type:** Retrofit Furnace

Program: A03b EnergywiseMF

Measure Description

The installation of high efficiency heating systems.

Baseline Description

The baseline is the existing heating system.

Savings Principle

The high efficiency case includes replacing heating systems with higher efficiency systems.

Savings Method

Calculated using site-specific inputs

Unit

Installed high-efficiency heating system.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Gross MMBtu_Oil = Qty × deltaMMBtu_Oil

Gross MMBtu_Propane = Qty× deltaMMBtu_Propane

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

deltaMMBtu_Oil = Average annual oil reduction per unit

deltaMMBtu_Propane = Average annual propane reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heating System Retrofit-Furnace	132.0	0.0700	0.00	0.00	0.00	14.30	0.00

Electric kWh Source: The Cadmus Group, Inc. (2012). Low Income Single Family Impact Evaluation. Prepared for the Electric and Gas Program Administrators of Massachusetts.

Electric kW Source: The Cadmus Group, Inc. (2012). Low Income Single Family Impact Evaluation. Prepared for the Electric and Gas Program Administrators of Massachusetts.

Oil MMBtu Source: The Cadmus Group, Inc. (2012). Low Income Single Family Impact Evaluation. Prepared for the Electric and Gas Program Administrators of Massachusetts.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heating System Retrofit-Furnace	17	1.00	1.00		1.00	1.00	1.00	0.00	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heating System Retrofit-Furnace	38.00%	62.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

CFwp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heating System Retrofit-Furnace	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heating System Retrofit-Furnace	0.00	0.00	0.00	1.00

NTG Source: The Cadmus Group, Inc (2008). EnergyWise 2008 Program Evaluation.

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

INSULATION ELEC WITH AC

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Building Shell | **Measure Type:** Insulation | **Measure Sub Type:** Electric with AC

Program: A03b EnergywiseMF

Measure Description

Shell insulation upgrades applied in existing facilities including improved insulation in attics, basements and sidewalls.

Baseline Description

The baseline efficiency case is any existing home shell measures.

Savings Principle

The high efficiency case includes increased weatherization insulation levels.

Savings Method

Calculated using site-specific inputs

Unit

Completed insulation project.

Savings Equation

Gross kWh = SQFT × deltakWh/SQFT × (1/R_pre - 1/R_post)

Gross kW = Gross kWh × kW/kWh

Where:

SQFT = Square feet of insulation installed

deltakWh/SQFT = Average annual kWh reduction per SQFT of insulation

R_pre = R-Value of the existing insulation

R_post =R-Value of the new installed insulation

Gross kWh = Stories × SQFT × (CFM/SQFT_pre - CFM/SQFT_post) × deltakWh/CFM

kW/kWh = Average annual kW reduction per kWh reduction

Hours: 4,644.0.

Hours Source: NOAA Weather data: An average BASE 60 Annual Heating Degree Day value for weather stations in Rhode Island and southeastern Massachusetts based on NOAA 30-year data.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
INSULATION ELEC WITH AC	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
INSULATION ELEC WITH AC	25	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
INSULATION ELEC WITH AC	6.59%	3.85%	47.32%	42.24%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
INSULATION ELEC WITH AC	0.00	0.00	47.31	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
INSULATION ELEC WITH AC	0.33	0.01	0.00	0.68

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

INSULATION OIL

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Building Shell | **Measure Type:** Insulation | **Measure Sub Type:** Oil

Program: A03b EnergywiseMF

Measure Description

Shell insulation upgrades applied in existing facilities including improved insulation in attics, basements and sidewalls.

Baseline Description

The baseline efficiency case is any existing home shell measures.

Savings Principle

The high efficiency case includes increased weatherization insulation levels.

Savings Method

Calculated using site-specific inputs

Unit

Completed insulation project.

Savings Equation

Gross kWh = SQFT × deltakWh/SQFT × (1/R_pre - 1/R_post)

Gross kW = Gross kWh × kW/kWh

Where:

SQFT = Square feet of insulation installed

deltakWh/SQFT = Average annual kWh reduction per SQFT of insulation

R_pre = R-Value of the existing insulation

R_post =R-Value of the new installed insulation

Gross kWh = Stories × SQFT × (CFM/SQFT_pre - CFM/SQFT_post) × deltakWh/CFM

kW/kWh = Average annual kW reduction per kWh reduction

Hours: 4,644.0.

Hours Source: NOAA Weather data: An average BASE 60 Annual Heating Degree Day value for weather stations in Rhode Island and southeastern Massachusetts based on NOAA 30-year data.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
INSULATION OIL	Calc	Calc	0.00	0.00	0.00	7.17	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
INSULATION OIL	25	1.00	1.00		1.00	1.00	1.00	1.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
INSULATION OIL	1.00%	4.00%	53.00%	42.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

CFwp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
INSULATION OIL	0.00	0.00	47.31	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
INSULATION OIL	0.33	0.01	0.00	0.68

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Participant

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Participant | **Measure Type:** Participant | **Measure Sub Type:** Participant

Program: A03b EnergywiseMF

Measure Description

This row identifies a participant for tracking and cost purposes.

Baseline Description

Savings Principle

Savings Method

Unit

Per participant

Savings Equation

N/A

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Participant	0	0	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Participant	11	1.00	1.00		0.86	0.86	0.86	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Participant	0.00%	0.00%	0.00%	0.00%

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Participant	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Participant	0.00	0.00	0.00	1.00

TRC: $454.00 / participant

Incentive: $363.00 / participant

Pipe Wrap DHW Elec

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Insulation | **Measure Sub Type:** Pipe Insulation

Program: A03b EnergywiseMF

Measure Description

Installation of insulation to reduce water heating energy.

Baseline Description

The baseline case is uninsulated heated water pipes.

Savings Principle

The high efficiency case is the installation of high-efficiency domestic hot water equipment such as low-flow showerheads and faucet aerators.

Savings Method

Deemed

Unit

Linear Foot

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Pipe Wrap DHW Elec	38.0	0.0060	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Pipe Wrap DHW Elec	15	0.90	1.00		1.00	1.00	1.00	0.31	0.81

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Pipe Wrap DHW Elec	41.52%	31.39%	15.22%	11.88%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

Measure Life Note: Massachusetts Common Assumption

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Pipe Wrap DHW Elec	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Pipe Wrap DHW Elec	0.08	0.01	0.00	0.93

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Pipe Wrap DHW Oil

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Insulation | **Measure Sub Type:** Pipe Insulation

Program: A03b EnergywiseMF

Measure Description

Installation of insulation to reduce water heating energy.

Baseline Description

The baseline case is uninsulated heated water pipes.

Savings Principle

The high efficiency case is the installation of high-efficiency domestic hot water equipment such as low-flow showerheads and faucet aerators.

Savings Method

Deemed

Unit

Linear Foot

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Pipe Wrap DHW Oil	0	0	0.00	0.00	0.00	0.15	0.00

Oil MMBtu Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Pipe Wrap DHW Oil	15	0.90	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Pipe Wrap DHW Oil	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

Measure Life Note: Massachusetts Common Assumption

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

CFwp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Pipe Wrap DHW Oil	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Pipe Wrap DHW Oil	0.08	0.01	0.00	0.93

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Refrig Rebate

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Appliances | **Measure Type:** Refrigerators | **Measure Sub Type:** Refrigerator

Program: A03b EnergywiseMF

Measure Description

This measure covers the replacement of an existing inefficient refrigerator with a new ENERGY STAR® rated refrigerator. ENERGY STAR® qualified refrigerators use at least 20% less energy than non-qualified models.

Baseline Description

The baseline efficiency case is the existing refrigerator. It is assumed that low-income customers would otherwise replace their refrigerators with a used inefficient unit.

Savings Principle

The high efficiency case is an ENERGY STAR® rated refrigerator that meets the ENERGY STAR® criteria for full-sized refrigerators (7.75 cubic feet), using at least 20% less energy than models meeting the minimum Federal government standard.

Savings Method

Deemed

Unit

Installed high-efficiency refrigerator.

Savings Equation

delta kWh = ((kWhpre-kWhes) x (RUL/EUL)) + (((kWhstd+kWhused)/2 - kWhes) x ((EUL-RUL)/EUL)) x Focc

Where:

kWhpre = Annual kWh consumption of existing equipment. Value is based on metering or AHAM database. The default value is 874 kWh.

kWhES = Annual kWhconsumption of new ENERGY STAR qualified refrigerator or freezer. This is from the nameplate on the new unit. The default value is 358 kWh.

STD Average annual consumption of equipment meeting federal standard: Calculated by dividing the kWhES by 0.9 (i.e., the Energy Star units are assumed to be 10% more efficient than the kWhstd units). The default value is

398 kWh.

kWhused Average annual consumption of used equipment. Default value is 475 kWh.34

RUL = Remaining Useful life assumed to be 6 years

EUL = Estimated useful life for a new refrigerator is 12 years35

Focc = Occupant adjustment factor used to adjust the energy savings according to the number of occupants in the dwelling unit. See table below. Default is 2.3 occupants per tenant unit

ΔkWh = 330, using the default assumptions

Hours: 8,760.0.

Hours Note: The average annual operating hours are 8760 hours/year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Refrig Rebate	914.0	0.1645	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Refrig Rebate	12	1.00	1.00		1.00	1.00	1.00	0.79	0.65

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Refrig Rebate	29.00%	31.95%	18.18%	20.87%

Measure Life Source: Environmental Protection Agency (2009). Life Cycle Cost Estimate for ENERGY STAR Qualified Residential Refrigerator.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rates are 100% since savings estimates are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Refrig Rebate	0.00	0.00	20.10	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Refrig Rebate	0.00	0.00	0.00	1.00

NTG Source: The Cadmus Group, Inc (2008). EnergyWise 2008 Program Evaluation.

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

SHOWERHEAD Elec

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Faucet Aerator

Program: A03b EnergywiseMF

Measure Description

Installation of a faucet aerator with a flow rate of 1.5 GPM or less on an existing faucet with high flow in a commercial setting with service water heated by electricity.

Baseline Description

The baseline efficiency case is 2.2 GPM or greater faucet.

Savings Principle

The high efficiency case is a faucet with 1.5 GPM or less aerator installed.

Savings Method

Deemed

Unit

Installed faucet aerator.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
SHOWERHEAD Elec	246.0	0.0590	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
SHOWERHEAD Elec	15	0.90	1.00		1.00	1.00	1.00	0.31	0.81

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
SHOWERHEAD Elec	41.52%	31.39%	15.22%	11.88%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

Measure Life Note: National Grid assumption based on regional PA working groups.

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

RRsp Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

RRwp Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
SHOWERHEAD Elec	1786.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
SHOWERHEAD Elec	0.08	0.01	0.00	0.93

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

SHOWERHEAD Oil

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: A03b EnergywiseMF

Measure Description

Installation of a low flow showerhead with a flow rate of 1.5 GPM or less.

Baseline Description

The baseline efficiency case is a showerhead with a flow of 2.5 gpm. For home audit applications, the baseline is the existing showerhead.

Savings Principle

The high efficiency is a low-flow showerhead with a flow of 1.5 gpm or less.

Savings Method

Deemed

Unit

Installed showerhead.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
SHOWERHEAD Oil	0	0	0.00	0.00	0.00	1.40	0.00

Oil MMBtu Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
SHOWERHEAD Oil	15	0.90	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
SHOWERHEAD Oil	0.00%	0.00%	0.00%	0.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

Measure Life Note: National Grid assumption based on regional PA working groups.

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

CFwp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
SHOWERHEAD Oil	1786.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
SHOWERHEAD Oil	0.08	0.01	0.00	0.93

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Smart Strips

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Plug Load | **Measure Type:** Smart Strips | **Measure Sub Type:** Smart Strip

Program: A03b EnergywiseMF

Measure Description

The basic measures switches off plug load using current sensors and switching devices which turn off plug load when electrical current drops below threshold low levels. The advanced measure shuts devices off after it no longer senses activity from their infrared controls.

Baseline Description

The baseline efficiency case is the absence power strip and leaving peripheral devices plugged in or using a power surge protector and leaving peripheral devices on

Savings Principle

The high efficiency case is the use of a smart strip or advanced smart strip.

Savings Method

Deemed

Unit

Rebated smart strip.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: 8,760.0.

Hours Note: Since the power strip is assumed to be plugged in all year, the savings are based on 8,760 operational hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Smart Strips	105.0	0.0189	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, Inc. (2019). Advanced Power Strip Metering Study- Revised

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Smart Strips	5	0.84	1.00		0.92	0.92	0.92	0.73	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Smart Strips	34.00%	33.00%	16.00%	17.00%

Measure Life Note: Massachusetts Common Assumption

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: NMR Group, Inc. (2019). Advanced Power Strip Metering Study- Revised

RRsp Source: NMR Group, Inc. (2019). Advanced Power Strip Metering Study- Revised

RRwp Source: NMR Group, Inc. (2019). Advanced Power Strip Metering Study- Revised

CFsp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

CFwp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Smart Strips	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Smart Strips	0.31	0.01	0.00	0.70

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

THERMOSTAT Elec with AC

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: A03b EnergywiseMF

Measure Description

Installation of programmable thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule to meet occupancy needs and minimize redundant HVAC operation.

Baseline Description

The baseline efficiency case is an HVAC system providing space heating without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system providing space heating with a programmable thermostat installed.

Savings Method

Deemed

Unit

Installed thermostat

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
THERMOSTAT Elec with AC	278.0	0.2363	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
THERMOSTAT Elec with AC	13	0.95	1.00		1.00	1.00	1.00	0.34	0.17

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
THERMOSTAT Elec with AC	23.21%	27.86%	25.20%	23.73%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
THERMOSTAT Elec with AC	0.00	0.00	14.35	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
THERMOSTAT Elec with AC	0.48	0.01	0.00	0.53

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

THERMOSTAT Heat Pump

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: A03b EnergywiseMF

Measure Description

Installation of programmable thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule to meet occupancy needs and minimize redundant HVAC operation.

Baseline Description

The baseline efficiency case is an HVAC system providing space heating without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system providing space heating with a programmable thermostat installed.

Savings Method

Deemed

Unit

Installed thermostat

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
THERMOSTAT Heat Pump	278.0	0.2363	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
THERMOSTAT Heat Pump	13	0.95	1.00		1.00	1.00	1.00	0.34	0.17

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
THERMOSTAT Heat Pump	23.21%	27.86%	25.20%	23.73%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
THERMOSTAT Heat Pump	0.00	0.00	14.35	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
THERMOSTAT Heat Pump	0.48	0.01	0.00	0.53

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

THERMOSTAT OIL

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: A03b EnergywiseMF

Measure Description

Installation of programmable thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule to meet occupancy needs and minimize redundant HVAC operation.

Baseline Description

The baseline efficiency case is an HVAC system providing space heating without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system providing space heating with a programmable thermostat installed.

Savings Method

Deemed

Unit

Installed thermostat

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
THERMOSTAT OIL	29.0	0.0247	0.00	0.00	0.00	1.60	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Oil MMBtu Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
THERMOSTAT OIL	13	0.95	1.00		1.00	1.00	1.00	0.34	0.17

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
THERMOSTAT OIL	23.21%	27.86%	25.20%	23.73%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
THERMOSTAT OIL	0.00	0.00	14.35	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
THERMOSTAT OIL	0.48	0.01	0.00	0.53

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

TSV Showerhead Elec

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: A03b EnergywiseMF

Measure Description

A showerhead with a control that limits flow once water is heated.

Baseline Description

The baseline efficiency case is a showerhead with a flow of 2.5 gpm. For home audit applications, the baseline is the existing showerhead.

Savings Principle

The high efficiency is a low-flow showerhead with a control that limits flow once the water is heated.

Savings Method

Deemed

Unit

Installed showerhead.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
TSV Showerhead Elec	315.0	0.0756	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
TSV Showerhead Elec	15	0.90	1.00		1.00	1.00	1.00	0.31	0.81

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
TSV Showerhead Elec	41.52%	31.39%	15.22%	11.88%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
TSV Showerhead Elec	2254.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
TSV Showerhead Elec	0.08	0.01	0.00	0.93

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

TSV Showerhead Oil

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: A03b EnergywiseMF

Measure Description

A showerhead with a control that limits flow once water is heated.

Baseline Description

The baseline efficiency case is a showerhead with a flow of 2.5 gpm. For home audit applications, the baseline is the existing showerhead.

Savings Principle

The high efficiency is a low-flow showerhead with a control that limits flow once the water is heated.

Savings Method

Deemed

Unit

Installed showerhead.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
TSV Showerhead Oil	0	Calc	0.00	0.00	0.00	1.70	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Oil MMBtu Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
TSV Showerhead Oil	15	0.90	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
TSV Showerhead Oil	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

CFwp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
TSV Showerhead Oil	2254.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
TSV Showerhead Oil	0.08	0.01	0.00	0.93

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

TSV Showerhead Other

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: A03b EnergywiseMF

Measure Description

A showerhead with a control that limits flow once water is heated.

Baseline Description

The baseline efficiency case is a showerhead with a flow of 2.5 gpm. For home audit applications, the baseline is the existing showerhead.

Savings Principle

The high efficiency is a low-flow showerhead with a control that limits flow once the water is heated.

Savings Method

Deemed

Unit

Installed showerhead.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
TSV Showerhead Other	0	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
TSV Showerhead Other	15	0.90	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
TSV Showerhead Other	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

CFwp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
TSV Showerhead Other	2254.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
TSV Showerhead Other	0.08	0.01	0.00	0.93

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Vending Miser

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Vending Miser | **Measure Type:** Vending Miser | **Measure Sub Type:** Vending Miser

Program: A03b EnergywiseMF

Measure Description

Controls significantly reduce the energy consumption of refrigerated beverage vending machine lighting and refrigeration systems by powering down these systems during periods of inactivity while maintaining a refrigerated product. This measure applies torefrigerated beverage vending machines and glass front refrigerated coolers. This measure does not apply to ENERGY STAR® qualified vending machines, as they already have built-in controls.

Baseline Description

The baseline efficiency case is a standard efficiency refrigerated beverage vending machine, or glass front refrigerated cooler without a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Savings Principle

The high efficiency case is a standard efficiency refrigerated beverage vending machine, or glass front refrigerated cooler with a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Savings Method

Deemed

Unit

Installed vending miser.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: 8,760.0.

Hours Note: It is assumed that the connected equipment operates 24 hours per day, 7 days per week for a total annual operating hours of 8,760.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Vending Miser	1,612.0	0.0000	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: USA Technologies Energy Management Product Sheets (2006). Accessed on 09/01/2009.

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Vending Miser	5	1.00	1.00		0.86	0.86	0.86	0.90	0.90

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Vending Miser	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRsp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRwp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFsp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

CFwp Source: Navigant Consulting (2018). Baseline Loadshape StudyCFwp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Vending Miser	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Vending Miser	0.00	0.00	0.00	1.00

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Home Energy Report, Existing Dual Fuel

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Behavior | **Measure Sub Type:** Home Energy Reports

Program: A03c Behavior/Feedback Program

Measure Description

A Home Energy report sent to electric and gas customers that displays home energy consumption in comparison with peers and prompts energy conserving behavior.

Baseline Description

No Home Energy Report.

Savings Principle

A home that receives Home Energy Reports.

Savings Method

Calculated by comparing consumption of treatment (with reports) and control groups (no reports)

Unit

Per participant

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Home Energy Report, Existing Dual Fuel	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Supplied by vendor

Electric kW Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Home Energy Report, Existing Dual Fuel	1	1.00	1.00		1.08	1.08	1.08	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Home Energy Report, Existing Dual Fuel	35.00%	31.00%	19.00%	15.00%

Measure Life Source: Opinion Dynamics with Navigant Consulting (2012). Massachusetts Three Year Cross-Cutting Behavioral Program Evaluation Integrated Report July 2012. Prepared for Massachusetts EEAC & Behavioral Research Team

ISR Source: RHODE ISLAND HOME ENERGY REPORT PROGRAM IMPACT AND PROCESS EVALUATION

ISR Note: In-service rates are set to 100% because savings represent average for all treatment household (including opt outs).

SPF Note: Savings persistence is 100% since measure life is 1 year.

RRe Source: Cadeo/Illume (2020). 2017-2019 Impact Evaluation of the Home Energy Reports Program

RRsp Source: Cadeo/Illume (2020). 2017-2019 Impact Evaluation of the Home Energy Reports Program

RRwp Source: Cadeo/Illume (2020). 2017-2019 Impact Evaluation of the Home Energy Reports Program

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Home Energy Report, Existing Dual Fuel	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Home Energy Report, Existing Dual Fuel	0.00	0.00	0.00	1.00

NTG Note: Net-t-gross is set to 100% since the HER program is implemented as a randomized control trial (RCT). RCT produces net savings accounting for free-ridership.

TRC: $8.00 / participant

Incentive: $8.00 / participant

Home Energy Report, Existing Electric

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Behavior | **Measure Sub Type:** Home Energy Reports

Program: A03c Behavior/Feedback Program

Measure Description

A Home Energy report sent to electric customers that displays home energy consumption in comparison with peers and prompts energy conserving behavior.

Baseline Description

No Home Energy Report.

Savings Principle

A home that receives Home Energy Reports.

Savings Method

Calculated by comparing consumption of treatment (with reports) and control groups (no reports)

Unit

Per participant

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Home Energy Report, Existing Electric	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Supplied by vendor

Electric kW Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Home Energy Report, Existing Electric	1	1.00	1.00		1.08	1.08	1.08	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Home Energy Report, Existing Electric	35.00%	31.00%	19.00%	15.00%

Measure Life Source: Opinion Dynamics with Navigant Consulting (2012). Massachusetts Three Year Cross-Cutting Behavioral Program Evaluation Integrated Report July 2012. Prepared for Massachusetts EEAC & Behavioral Research Team

ISR Source: RHODE ISLAND HOME ENERGY REPORT PROGRAM IMPACT AND PROCESS EVALUATION

ISR Note: In-service rates are set to 100% because savings represent average for all treatment household (including opt outs).

SPF Note: Savings persistence is 100% since measure life is 1 year.

RRe Source: Cadeo/Illume (2020). 2017-2019 Impact Evaluation of the Home Energy Reports Program

RRsp Source: Cadeo/Illume (2020). 2017-2019 Impact Evaluation of the Home Energy Reports Program

RRwp Source: Cadeo/Illume (2020). 2017-2019 Impact Evaluation of the Home Energy Reports Program

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Home Energy Report, Existing Electric	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Home Energy Report, Existing Electric	0.00	0.00	0.00	1.00

NTG Note: Net-t-gross is set to 100% since the HER program is implemented as a randomized control trial (RCT). RCT produces net savings accounting for free-ridership.

TRC: $8.00 / participant

Incentive: $8.00 / participant

Home Energy Report, New Movers Dual Fuel

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Behavior | **Measure Sub Type:** Home Energy Reports

Program: A03c Behavior/Feedback Program

Measure Description

A Home Energy report sent to electric and gas customers that displays home energy consumption in comparison with peers and prompts energy conserving behavior.

Baseline Description

No Home Energy Report.

Savings Principle

A home that receives Home Energy Reports.

Savings Method

Calculated by comparing consumption of treatment (with reports) and control groups (no reports)

Unit

Per participant

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Home Energy Report, New Movers Dual Fuel	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Supplied by vendor

Electric kW Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Home Energy Report, New Movers Dual Fuel	1	1.00	1.00		0.67	0.67	0.67	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Home Energy Report, New Movers Dual Fuel	35.00%	31.00%	19.00%	15.00%

Measure Life Source: Opinion Dynamics with Navigant Consulting (2012). Massachusetts Three Year Cross-Cutting Behavioral Program Evaluation Integrated Report July 2012. Prepared for Massachusetts EEAC & Behavioral Research Team

ISR Source: RHODE ISLAND HOME ENERGY REPORT PROGRAM IMPACT AND PROCESS EVALUATION

ISR Note: In-service rates are set to 100% because savings represent average for all treatment household (including opt outs).

SPF Note: Savings persistence is 100% since measure life is 1 year.

RRe Source: Cadeo/Illume (2020). 2017-2019 Impact Evaluation of the Home Energy Reports Program

RRsp Source: Cadeo/Illume (2020). 2017-2019 Impact Evaluation of the Home Energy Reports Program

RRwp Source: Cadeo/Illume (2020). 2017-2019 Impact Evaluation of the Home Energy Reports Program

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Home Energy Report, New Movers Dual Fuel	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Home Energy Report, New Movers Dual Fuel	0.00	0.00	0.00	1.00

NTG Note: Net-t-gross is set to 100% since the HER program is implemented as a randomized control trial (RCT). RCT produces net savings accounting for free-ridership.

TRC: $8.00 / participant

Incentive: $8.00 / participant

Home Energy Report, New Movers Electric

Sector: Residential | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Behavior | **Measure Sub Type:** Home Energy Reports

Program: A03c Behavior/Feedback Program

Measure Description

A Home Energy report sent to electric customers that displays home energy consumption in comparison with peers and prompts energy conserving behavior.

Baseline Description

No Home Energy Report.

Savings Principle

A home that receives Home Energy Reports.

Savings Method

Calculated by comparing consumption of treatment (with reports) and control groups (no reports)

Unit

Per participant

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Home Energy Report, New Movers Electric	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Supplied by vendor

Electric kW Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Home Energy Report, New Movers Electric	1	1.00	1.00		0.67	0.67	0.67	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Home Energy Report, New Movers Electric	35.00%	31.00%	19.00%	15.00%

Measure Life Source: Opinion Dynamics with Navigant Consulting (2012). Massachusetts Three Year Cross-Cutting Behavioral Program Evaluation Integrated Report July 2012. Prepared for Massachusetts EEAC & Behavioral Research Team

ISR Source: RHODE ISLAND HOME ENERGY REPORT PROGRAM IMPACT AND PROCESS EVALUATION

ISR Note: In-service rates are set to 100% because savings represent average for all treatment household (including opt outs).

SPF Note: Savings persistence is 100% since measure life is 1 year.

RRe Source: Cadeo/Illume (2020). 2017-2019 Impact Evaluation of the Home Energy Reports Program

RRsp Source: Cadeo/Illume (2020). 2017-2019 Impact Evaluation of the Home Energy Reports Program

RRwp Source: Cadeo/Illume (2020). 2017-2019 Impact Evaluation of the Home Energy Reports Program

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Home Energy Report, New Movers Electric	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Home Energy Report, New Movers Electric	0.00	0.00	0.00	1.00

NTG Note: Net-t-gross is set to 100% since the HER program is implemented as a randomized control trial (RCT). RCT produces net savings accounting for free-ridership.

TRC: $8.00 / participant

Incentive: $8.00 / participant

Advanced Power Strips IR

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Plug Load | **Measure Type:** Smart Strips | **Measure Sub Type:** Smart Strip

Program: A04b Energy Star Products

Measure Description

The basic measures switches off plug load using current sensors and switching devices which turn off plug load when electrical current drops below threshold low levels. The advanced measure shuts devices off after it no longer senses activity from their infrared controls.

Baseline Description

The baseline efficiency case is the absence power strip and leaving peripheral devices plugged in or using a power surge protector and leaving peripheral devices on

Savings Principle

The high efficiency case is the use of a smart strip or advanced smart strip.

Savings Method

Deemed

Unit

Rebated smart strip.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: 8,760.0.

Hours Note: Since the power strip is assumed to be plugged in all year, the savings are based on 8,760 operational hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Advanced Power Strips IR	207.0	0.0400	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, Inc. (2019). Advanced Power Strip Metering Study- Revised

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Advanced Power Strips IR	5	0.74	1.00		0.92	0.92	0.92	0.58	0.86

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Advanced Power Strips IR	32.00%	35.00%	15.00%	18.00%

Measure Life Note: Massachusetts Common Assumption

ISR Source: NMR Group, Inc. (2019). Advanced Power Strip Metering Study- Revised

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: NMR (2018). RLPNC 17-3 Smart Power Strip Metering Study

RRsp Source: NMR (2018). RLPNC 17-3 Smart Power Strip Metering Study

RRsp Note: National Grid assumption based on regional PA working groups.

RRwp Source: NMR (2018). RLPNC 17-3 Smart Power Strip Metering Study

RRwp Note: National Grid assumption based on regional PA working groups.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Advanced Power Strips IR	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Advanced Power Strips IR	0.00	0.00	0.00	1.00

NTG Note: Realization rate is assumed 100% because energy savings are custom calculated.

TRC: $100.00 / measure

Incentive: $35.00 / measure

Advanced Power Strips IR - OS

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Plug Load | **Measure Type:** Smart Strips | **Measure Sub Type:** Smart Strip

Program: A04b Energy Star Products

Measure Description

The basic measures switches off plug load using current sensors and switching devices which turn off plug load when electrical current drops below threshold low levels. The advanced measure shuts devices off after it no longer senses activity from their infrared controls and occupancy sensors.

Baseline Description

The baseline efficiency case is the absence power strip and leaving peripheral devices plugged in or using a power surge protector and leaving peripheral devices on

Savings Principle

The high efficiency case is the use of a smart strip or advanced smart strip.

Savings Method

Deemed

Unit

Rebated smart strip.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: 8,760.0.

Hours Note: Since the power strip is assumed to be plugged in all year, the savings are based on 8,760 operational hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Advanced Power Strips IR - OS	207.0	0.0400	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, Inc. (2019). Advanced Power Strip Metering Study- Revised

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Advanced Power Strips IR - OS	5	0.74	1.00		0.92	0.92	0.92	0.58	0.86

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Advanced Power Strips IR - OS	32.00%	35.00%	15.00%	18.00%

Measure Life Note: Massachusetts Common Assumption

ISR Source: NMR Group, Inc. (2019). Advanced Power Strip Metering Study- Revised

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: NMR (2018). RLPNC 17-3 Smart Power Strip Metering Study

RRsp Source: NMR (2018). RLPNC 17-3 Smart Power Strip Metering Study

RRsp Note: National Grid assumption based on regional PA working groups.

RRwp Source: NMR (2018). RLPNC 17-3 Smart Power Strip Metering Study

RRwp Note: National Grid assumption based on regional PA working groups.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Advanced Power Strips IR - OS	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Advanced Power Strips IR - OS	0.00	0.00	0.00	1.00

NTG Note: Realization rate is assumed 100% because energy savings are custom calculated.

TRC: $200.00 / measure

Incentive: $35.00 / measure

Dehumidifier

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** Dehumidifiers | **Measure Sub Type:** Dehumidifier

Program: A04b Energy Star Products

Measure Description

The Installation of high efficiency dehumidifiers and the turn-in of existing inefficient dehumidifiers.

Baseline Description

Standard efficiency.

Savings Principle

The high efficiency case is an ENERGY STAR® replacement unit with an efficiency of 1.47 L/kWh. The high efficiency case is an ENERGY STAR® replacement unit with an efficiency of 1.47 L/kWh.

Savings Method

Calculated using deemed inputs

Unit

Per dehumidifier

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dehumidifier	82.3	0.0189	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dehumidifier	17	0.99	1.00		1.00	1.00	1.00	0.82	0.17

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dehumidifier	22.00%	23.00%	25.00%	30.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: National Grid assumption based on regional PA working groups.

RRsp Note: National Grid assumption based on regional PA working groups.

RRwp Note: National Grid assumption based on regional PA working groups.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dehumidifier	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dehumidifier	0.51	0.00	0.00	0.49

NTG Source: NMR Group, Inc. (2021). Residential Products NTG Report.

TRC: $34.00 / measure

Incentive: $30.00 / measure

Dehumidifier Recycling

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** Dehumidifiers | **Measure Sub Type:** Dehumidifier

Program: A04b Energy Star Products

Measure Description

Recycling of old dehumidifiers.

Baseline Description

Operating inefficient unit.

Savings Principle

Recycling of inefficient unit.

Savings Method

Deemed

Unit

Per dehumidifier

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dehumidifier Recycling	407.1	0.0350	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dehumidifier Recycling	4	1.00	1.00		1.00	1.00	1.00	0.82	0.17

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dehumidifier Recycling	22.00%	23.00%	25.00%	30.00%

Measure Life Note: Massachusetts Common Assumption

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: National Grid assumption based on regional PA working groups.

RRsp Note: National Grid assumption based on regional PA working groups.

RRwp Note: National Grid assumption based on regional PA working groups.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dehumidifier Recycling	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dehumidifier Recycling	0.59	0.00	0.00	0.41

NTG Source: NMR Group, Inc. (2021). MA Appliance Recycling NTG Report

TRC: $65.00 / measure

Incentive: $30.00 / measure

EnergyStar Dryer

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** Clothes Dryers | **Measure Sub Type:** Dryer

Program: A04b Energy Star Products

Measure Description

The installation of an EnergyStar clothes dryer .

Baseline Description

A new electric dryer.

Savings Principle

An EnergyStar electric dryer.

Savings Method

Deemed

Unit

Installed EnergyStar dryer.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
EnergyStar Dryer	160.0	0.0460	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: MA TRM, 2016-2018: Energy Star Clothes Dryer

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
EnergyStar Dryer	16	0.99	1.00		1.00	1.00	1.00	0.45	0.58

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
EnergyStar Dryer	38.90%	30.00%	16.90%	14.20%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: National Grid assumption based on regional PA working groups.

RRsp Note: National Grid assumption based on regional PA working groups.

RRwp Note: National Grid assumption based on regional PA working groups.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
EnergyStar Dryer	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
EnergyStar Dryer	0.47	0.00	0.00	0.53

NTG Source: NMR Group, Inc. (2021). Residential Products NTG Report.

TRC: $70.00 / measure

Incentive: $50.00 / measure

Freezer Recycling

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** Recycling | **Measure Sub Type:** Freezer Recycling

Program: A04b Energy Star Products

Measure Description

The retirement of old, inefficient secondary refrigerators and freezers.

Baseline Description

The baseline efficiency case is an old, inefficient secondary working refrigerator or freezer. Estimated average usage is based on combined weight of freezer energy use and refrigerator energy use.

Savings Principle

The high efficiency case assumes no replacement of secondary unit.

Savings Method

Deemed

Unit

Removal of existing refrigerator or freezer.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: 8,760.0.

Hours Note: The average annual operating hours are 8760 hours/year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Freezer Recycling	754.0	0.1100	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, Inc. (2021). RI CT Appliance Recycling Impact Memo

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Freezer Recycling	8	1.00	1.00		0.83	0.83	0.83	0.91	0.68

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Freezer Recycling	29.00%	33.00%	17.00%	21.00%

Measure Life Source: NMR Group, Inc. (2011). Massachusetts Appliance Turn-In Program Evaluation Integrated Report Findings – FINAL. Prepared for National Grid, NSTAR Electric, Cape Light Compact, and Western Massachusetts Electric Company.

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: NMR Group, Inc. (2021). RI CT Appliance Recycling Impact Memo

RRsp Source: NMR Group, Inc. (2021). RI CT Appliance Recycling Impact Memo

RRwp Source: NMR Group, Inc. (2021). RI CT Appliance Recycling Impact Memo

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Freezer Recycling	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Freezer Recycling	0.50	0.00	0.00	0.50

NTG Source: NMR Group, Inc. (2021). RI CT Appliance Recycling Impact Memo

TRC: $200.00 / measure

Incentive: $95.00 / measure

Low E Storm Windows, Electric Heat

Sector: Residential

Fuel: Electric

Program Type: Prescriptive

Measure Category: Building Shell

Measure Type: Windows

Measure Sub Type: Storm Windows, electric heat

Program: A04b Energy Star Products

Measure Description

The installation of Low E storm windows over existing windows.

Baseline Description

The base case is existing windows.

Savings Principle

The high efficiency case is Low E storm windows installed over existing windows.

Savings Method

Deemed

Unit

Installed Low E storm windows.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low E Storm Windows, Electric Heat	229.0	0.1800	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Culp, Thomas D., & Cort, Katherine A. Energy Savings of Low-E Storm Windows and Panels across US Climate Zones. United States.

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low E Storm Windows, Electric Heat	20	1.00	1.00		1.00	1.00	1.00	0.34	0.20

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low E Storm Windows, Electric Heat	25.00%	30.00%	22.00%	23.00%

Measure Life Source: Culp, Thomas D., & Cort, Katherine A. Energy Savings of Low-E Storm Windows and Panels across US Climate Zones. United States.

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: National Grid assumption based on regional PA working groups.

RRsp Note: National Grid assumption based on regional PA working groups.

RRwp Note: National Grid assumption based on regional PA working groups.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low E Storm Windows, Electric Heat	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low E Storm Windows, Electric Heat	0.00	0.00	0.00	1.00

TRC: $55.00 / measure

Incentive: $25.00 / measure

Low E Storm Windows, Gas Heat

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Storm Windows, gas heat

Program: A04b Energy Star Products

Measure Description

The installation of Low E storm windows over existing windows.

Baseline Description

The base case is existing windows.

Savings Principle

The high efficiency case is Low E storm windows installed over existing windows.

Savings Method

Deemed

Unit

Installed Low E storm windows.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low E Storm Windows, Gas Heat	5.0	0.0000	0.76	0.00	0.00	0.00	0.00

Electric kWh Source: Culp, Thomas D., & Cort, Katherine A. Energy Savings of Low-E Storm Windows and Panels across US Climate Zones. United States.

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Gas Heat MMBtu Source: Culp, Thomas D., & Cort, Katherine A. Energy Savings of Low-E Storm Windows and Panels across US Climate Zones. United States.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low E Storm Windows, Gas Heat	20	1.00	1.00		1.00	1.00	1.00	0.34	0.20

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low E Storm Windows, Gas Heat	25.00%	30.00%	22.00%	23.00%

Measure Life Source: Culp, Thomas D., & Cort, Katherine A. Energy Savings of Low-E Storm Windows and Panels across US Climate Zones. United States.

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: National Grid assumption based on regional PA working groups.

RRsp Note: National Grid assumption based on regional PA working groups.

RRwp Note: National Grid assumption based on regional PA working groups.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low E Storm Windows, Gas Heat	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low E Storm Windows, Gas Heat	0.00	0.00	0.00	1.00

TRC: $55.00 / measure

Incentive: $35.00 / measure

Low E Storm Windows, Other Heat

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Storm Windows, other heat

Program: A04b Energy Star Products

Measure Description

The installation of Low E storm windows over existing windows.

Baseline Description

The base case is existing windows.

Savings Principle

The high efficiency case is Low E storm windows installed over existing windows.

Savings Method

Deemed

Unit

Installed Low E storm windows.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low E Storm Windows, Other Heat	5.0	0.0000	0.00	0.00	0.00	0.76	0.00

Electric kWh Source: Culp, Thomas D., & Cort, Katherine A. Energy Savings of Low-E Storm Windows and Panels across US Climate Zones. United States.

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Oil MMBtu Source: Culp, Thomas D., & Cort, Katherine A. Energy Savings of Low-E Storm Windows and Panels across US Climate Zones. United States.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low E Storm Windows, Other Heat	20	1.00	1.00		1.00	1.00	1.00	0.34	0.20

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low E Storm Windows, Other Heat	25.00%	30.00%	22.00%	23.00%

Measure Life Source: Culp, Thomas D., & Cort, Katherine A. Energy Savings of Low-E Storm Windows and Panels across US Climate Zones. United States.

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: National Grid assumption based on regional PA working groups.

RRsp Note: National Grid assumption based on regional PA working groups.

RRwp Note: National Grid assumption based on regional PA working groups.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low E Storm Windows, Other Heat	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low E Storm Windows, Other Heat	0.00	0.00	0.00	1.00

TRC: $55.00 / measure

Incentive: $25.00 / measure

Low-Flow Showerhead with Thermo Control (Roadrunner, Electric DHW)

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: A04b Energy Star Products

Measure Description

A showerhead with a control that limits flow once water is heated.

Baseline Description

The baseline case is a showerhead with a flow of 2.5 gallons per minute, or for the case of the adapter, a low flow showerhead with flow of 1.5 gpm or less.

Savings Principle

The high efficiency is a low-flow showerhead with a control that limits flow once the water is heated.

Savings Method

Deemed

Unit

Installed low-flow showerhead

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low-Flow Showerhead with Thermo Control (Roadrunner, Electric DHW)	247.0	0.0600	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low-Flow Showerhead with Thermo Control (Roadrunner, Electric DHW)	7	0.78	1.00		1.00	1.00	1.00	0.31	0.81

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low-Flow Showerhead with Thermo Control (Roadrunner, Electric DHW)	42.00%	31.00%	15.00%	12.00%

Measure Life Note: Massachusetts Common Assumption

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: National Grid assumption based on regional PA working groups.

RRsp Note: National Grid assumption based on regional PA working groups.

RRwp Note: National Grid assumption based on regional PA working groups.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low-Flow Showerhead with Thermo Control (Roadrunner, Electric DHW)	3022.00	0.00	0	0

Water/Sewer Source: PGE Low Flow Showerhead and Thermostatic Restriction Valve

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low-Flow Showerhead with Thermo Control (Roadrunner, Electric DHW)	0.03	0.00	0.00	0.97

NTG Source: NMR Group, Inc. (2021). Residential Products NTG Report.

TRC: $40.00 / measure

Incentive: $15.00 / measure

Low-Flow Showerhead with Thermo Control (Roadrunner, Gas DHW)

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: A04b Energy Star Products

Measure Description

A showerhead with a control that limits flow once water is heated.

Baseline Description

The baseline case is a showerhead with a flow of 2.5 gallons per minute, or for the case of the adapter, a low flow showerhead with flow of 1.5 gpm or less.

Savings Principle

The high efficiency is a low-flow showerhead with a control that limits flow once the water is heated.

Savings Method

Deemed

Unit

Installed low-flow showerhead

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low-Flow Showerhead with Thermo Control (Roadrunner, Gas DHW)	0	0.0000	0.00	1.22	0.00	0.00	0.00

Gas DHW MMBtu Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low-Flow Showerhead with Thermo Control (Roadrunner, Gas DHW)	7	0.78	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low-Flow Showerhead with Thermo Control (Roadrunner, Gas DHW)	0.00%	0.00%	0.00%	0.00%

Measure Life Note: Massachusetts Common Assumption

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: National Grid assumption based on regional PA working groups.

RRsp Note: National Grid assumption based on regional PA working groups.

RRwp Note: National Grid assumption based on regional PA working groups.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low-Flow Showerhead with Thermo Control (Roadrunner, Gas DHW)	3022.00	0.00	0	0

Water/Sewer Source: PGE Low Flow Showerhead and Thermostatic Restriction Valve

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low-Flow Showerhead with Thermo Control (Roadrunner, Gas DHW)	0.03	0.00	0.00	0.97

NTG Source: NMR Group, Inc. (2021). Residential Products NTG Report.

TRC: $40.00 / measure

Incentive: $15.00 / measure

Low-Flow Showerhead with Thermo Control (Roadrunner, Oil/Propane DHW)

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: A04b Energy Star Products

Measure Description

A showerhead with a control that limits flow once water is heated.

Baseline Description

The baseline case is a showerhead with a flow of 2.5 gallons per minute, or for the case of the adapter, a low flow showerhead with flow of 1.5 gpm or less.

Savings Principle

The high efficiency is a low-flow showerhead with a control that limits flow once the water is heated.

Savings Method

Deemed

Unit

Installed low-flow showerhead

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low-Flow Showerhead with Thermo Control (Roadrunner, Oil/Propane DHW)	0	0.0000	0.00	0.00	0.00	1.32	1.22

Oil MMBtu Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

Propane MMBtu Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low-Flow Showerhead with Thermo Control (Roadrunner, Oil/Propane DHW)	7	0.78	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low-Flow Showerhead with Thermo Control (Roadrunner, Oil/Propane DHW)	0.00%	0.00%	0.00%	0.00%

Measure Life Note: Massachusetts Common Assumption

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: National Grid assumption based on regional PA working groups.

RRsp Note: National Grid assumption based on regional PA working groups.

RRwp Note: National Grid assumption based on regional PA working groups.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low-Flow Showerhead with Thermo Control (Roadrunner, Oil/Propane DHW)	3022.00	0.00	0	0

Water/Sewer Source: PGE Low Flow Showerhead and Thermostatic Restriction Valve

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low-Flow Showerhead with Thermo Control (Roadrunner, Oil/Propane DHW)	0.03	0.00	0.00	0.97

NTG Source: NMR Group, Inc. (2021). Residential Products NTG Report.

TRC: $40.00 / measure

Incentive: $15.00 / measure

Pool Pump (2-Speed)

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Motors/Drives | **Measure Type:** Variable Speed Drive | **Measure Sub Type:** Pump

Program: A04b Energy Star Products

Measure Description

The installation of a 2-speed or variable speed drive pool pump. Operating a pool pump for a longer period of time at a lower wattage can move the same amount of water using significantly less energy.

Baseline Description

The baseline efficiency case is a single speed pump.

Savings Principle

The high efficiency case is a 2-speed or variable speed pump.

Savings Method

Calculated using deemed inputs

Unit

Installed efficient pool pump.

Savings Equation

Gross kWh = Qty × kWh_base × %SAVE

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

kWh_base = Deemed average annual kWh consumption per baseline unit.

%SAVE = Deemed average savings factor.

DeltakW = Deemed average kW reduction per unit.

Hours: N/A.

Hours Note: Hours are considered on a case-by-case basis since they are dependent on seasonal factors, pool size, and treatment conditions.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Pool Pump (2-Speed)	639.0	0.6700	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Guidehouse (2021). Comprehensive TRM Review.

Electric kW Source: Guidehouse (2021). Comprehensive TRM Review.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Pool Pump (2-Speed)	6	1.00	1.00		1.00	1.00	1.00	0.55	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Pool Pump (2-Speed)	5.00%	2.00%	55.00%	38.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: National Grid assumption based on regional PA working groups.

RRsp Note: National Grid assumption based on regional PA working groups.

RRwp Note: National Grid assumption based on regional PA working groups.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Pool Pump (2-Speed)	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Pool Pump (2-Speed)	0.11	0.00	0.00	0.89

NTG Source: NMR Group, Inc. (2021). Residential Products NTG Report.

TRC: $300.00 / measure

Incentive: $200.00 / measure

Pool Pump (Variable)

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Motors/Drives | **Measure Type:** Variable Speed Drive | **Measure Sub Type:** Pump

Program: A04b Energy Star Products

Measure Description

The installation of a 2-speed or variable speed drive pool pump. Operating a pool pump for a longer period of time at a lower wattage can move the same amount of water using significantly less energy.

Baseline Description

The baseline efficiency case is a single speed pump.

Savings Principle

The high efficiency case is a 2-speed or variable speed pump.

Savings Method

Calculated using deemed inputs

Unit

Installed efficient pool pump.

Savings Equation

Gross kWh = Qty × kWh_base × %SAVE

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

kWh_base = Deemed average annual kWh consumption per baseline unit.

%SAVE = Deemed average savings factor.

DeltakW = Deemed average kW reduction per unit.

Hours: N/A.

Hours Note: Hours are considered on a case-by-case basis since they are dependent on seasonal factors, pool size, and treatment conditions.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Pool Pump (Variable)	1,284.0	1.3500	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Guidehouse (2021). Comprehensive TRM Review.

Electric kW Source: Guidehouse (2021). Comprehensive TRM Review.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Pool Pump (Variable)	6	1.00	1.00		1.00	1.00	1.00	0.55	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Pool Pump (Variable)	5.00%	2.00%	55.00%	38.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: National Grid assumption based on regional PA working groups.

RRsp Note: National Grid assumption based on regional PA working groups.

RRwp Note: National Grid assumption based on regional PA working groups.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Pool Pump (Variable)	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Pool Pump (Variable)	0.11	0.00	0.00	0.89

NTG Source: NMR Group, Inc. (2021). Residential Products NTG Report.

TRC: $650.00 / measure

Incentive: $500.00 / measure

Refrigerator Recycle

Sector: Residential

Fuel: Electric

Program Type: Prescriptive

Measure Category: Appliances

Measure Type: Recycling

Measure Sub Type: Refrigerator Recycling

Program: A04b Energy Star Products

Measure Description

The retirement of old, inefficient secondary refrigerators and freezers.

Baseline Description

The baseline efficiency case is an old, inefficient secondary working refrigerator or freezer. Estimated average usage is based on combined weight of freezer energy use and refrigerator energy use.

Savings Principle

The high efficiency case assumes no replacement of secondary unit.

Savings Method

Deemed

Unit

Removal of existing refrigerator or freezer.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: 8,760.0.

Hours Note: The average annual operating hours are 8760 hours/year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Refrigerator Recycle	983.0	0.1800	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, Inc. (2021). RI CT Appliance Recycling Impact Memo

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Refrigerator Recycle	8	1.00	1.00		0.90	0.90	0.90	0.79	0.65

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Refrigerator Recycle	29.00%	32.00%	18.00%	21.00%

Measure Life Source: NMR Group, Inc. (2011). Massachusetts Appliance Turn-In Program Evaluation Integrated Report Findings – FINAL. Prepared for National Grid, NSTAR Electric, Cape Light Compact, and Western Massachusetts Electric Company.

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: NMR Group, Inc. (2021). RI CT Appliance Recycling Impact Memo

RRsp Source: NMR Group, Inc. (2021). RI CT Appliance Recycling Impact Memo

RRwp Source: NMR Group, Inc. (2021). RI CT Appliance Recycling Impact Memo

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Refrigerator Recycle	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Refrigerator Recycle	0.54	0.00	0.00	0.46

NTG Source: NMR Group, Inc. (2021). RI CT Appliance Recycling Impact Memo

TRC: $200.00 / measure

Incentive: $95.00 / measure

Refrigerator Recycling (Primary)

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** Refrigerator Recycling | **Measure Sub Type:** Refrigerator Recycling

Program: A04b Energy Star Products

Measure Description

The retirement of old, inefficient primary refrigerators and freezers.

Baseline Description

The baseline efficiency case is an old, inefficient primary working refrigerator or freezer. Estimated average usage is based on combined weight of freezer energy use and refrigerator energy use.

Savings Principle

The high efficiency case is the replacement of the refrigerator with an Energy Star® refrigerator or a model that is ENERGY STAR® rated and included in the Most Efficient® or Top Ten USA® ranking.

Savings Method

Deemed

Unit

Removal of existing refrigerator or freezer.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Refrigerator Recycling (Primary)	983.0	0.1800	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, Inc. (2021). RI CT Appliance Recycling Impact Memo

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Refrigerator Recycling (Primary)	8	1.00	1.00		0.90	0.90	0.90	0.79	0.65

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Refrigerator Recycling (Primary)	29.00%	32.00%	18.00%	21.00%

Measure Life Source: NMR Group, Inc. (2011). Massachusetts Appliance Turn-In Program Evaluation Integrated Report Findings – FINAL. Prepared for National Grid, NSTAR Electric, Cape Light Compact, and Western Massachusetts Electric Company.

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: NMR Group, Inc. (2021). RI CT Appliance Recycling Impact Memo

RRsp Source: NMR Group, Inc. (2021). RI CT Appliance Recycling Impact Memo

RRwp Source: NMR Group, Inc. (2021). RI CT Appliance Recycling Impact Memo

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Refrigerator Recycling (Primary)	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Refrigerator Recycling (Primary)	0.54	0.00	0.00	0.46

NTG Source: NMR Group, Inc. (2021). RI CT Appliance Recycling Impact Memo

TRC: $200.00 / measure

Incentive: $95.00 / measure

Room AC (10.8)

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Cooling | **Measure Sub Type:** Room AC

Program: A04b Energy Star Products

Measure Description

The installation of ENERGY STAR® qualified room air conditioners. ENERGY STAR® qualified air conditioners are typically 10% more efficient than models meeting federal standards.

Baseline Description

The baseline efficiency case is a window AC unit that meets the minimum federal efficiency standard for efficiency which currently is EER 9.8.

Savings Principle

The high efficiency level is a room AC unit meeting or exceeding the federal efficiency standard by 10% or more. Average size is 10,000 Btu and average EERs is 10.8.

Savings Method

Deemed

Unit

Installed high-efficiency room air-conditioner.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Room AC (10.8)	36.0	0.0600	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Environmental Protection Agency (2018). Savings Calculator for Energy Star Qualified Appliances. http://www.energystar.gov/sites/default/files/asset/document/appliance_calculator.xlsx

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Room AC (10.8)	12	1.00	1.00		1.00	1.00	1.00	0.33	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Room AC (10.8)	3.00%	2.00%	48.00%	47.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: National Grid assumption based on regional PA working groups.

RRsp Note: National Grid assumption based on regional PA working groups.

RRwp Note: National Grid assumption based on regional PA working groups.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Room AC (10.8)	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Room AC (10.8)	0.44	0.00	0.00	0.56

NTG Source: NMR Group, Inc. (2021). Residential Products NTG Report.

TRC: $40.00 / measure

Incentive: $40.00 / measure

Room Air Cleaners

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Plug Load | **Measure Type:** Room Air Cleaners | **Measure Sub Type:** Room Air Cleaner

Program: A04b Energy Star Products

Measure Description

Rebates provided for the purchase of an ENERGY STAR® qualified room air cleaner. ENERGY STAR® air cleaners are 40% more energy-efficient than standard models.

Baseline Description

The baseline efficiency case is a conventional unit with clean air delivery rate (CADR) of 51-100.

Savings Principle

The high efficiency case is an ENERGY STAR® qualified air cleaner with a CADR of 51-100.

Savings Method

Deemed

Unit

Rebated ENERGY STAR® room air cleaner

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 5,840.0.

Hours Source: Environmental Protection Agency (2012), Savings Calculator for Energy Star Qualified Appliances

Hours Note: The Savings are based on 16 operating hours per day, 365 days per year

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Room Air Cleaners	391.0	0.0900	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Environmental Protection Agency (2018). Savings Calculator for Energy Star Qualified Appliances. http://www.energystar.gov/sites/default/files/asset/document/appliance_calculator.xlsx

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Room Air Cleaners	9	0.97	1.00		1.00	1.00	1.00	0.82	0.17

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Room Air Cleaners	22.00%	23.00%	25.00%	30.00%

Measure Life Source: Environmental Protection Agency (2018). Savings Calculator for Energy Star Qualified Appliances. http://www.energystar.gov/sites/default/files/asset/document/appliance_calculator.xlsx

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: National Grid assumption based on regional PA working groups.

RRsp Note: National Grid assumption based on regional PA working groups.

RRwp Note: National Grid assumption based on regional PA working groups.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Room Air Cleaners	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Room Air Cleaners	0.37	0.00	0.00	0.63

NTG Source: NMR Group, Inc. (2021). Residential Products NTG Report.

TRC: $78.00 / measure

Incentive: $40.00 / measure

Smart Strips

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Plug Load | **Measure Type:** Smart Strips | **Measure Sub Type:** Smart Strip

Program: A04b Energy Star Products

Measure Description

The basic measures switches off plug load using current sensors and switching devices which turn off plug load when electrical current drops below threshold low levels. The advanced measure shuts devices off after it no longer senses activity from their infrared controls.

Baseline Description

The baseline efficiency case is the absence power strip and leaving peripheral devices plugged in or using a power surge protector and leaving peripheral devices on

Savings Principle

The high efficiency case is the use of a smart strip or advanced smart strip.

Savings Method

Deemed

Unit

Per smart strip

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: 8,760.0.

Hours Note: Since the power strip is assumed to be plugged in all year, the savings are based on 8,760 operational hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Smart Strips	105.0	0.0200	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, Inc. (2019). Advanced Power Strip Metering Study- Revised

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Smart Strips	5	0.81	1.00		0.92	0.92	0.92	0.58	0.86

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Smart Strips	32.00%	35.00%	15.00%	18.00%

Measure Life Note: Massachusetts Common Assumption

ISR Source: NMR Group, Inc. (2019). Advanced Power Strip Metering Study- Revised

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: NMR (2018). RLPNC 17-3 Smart Power Strip Metering Study

RRsp Source: NMR (2018). RLPNC 17-3 Smart Power Strip Metering Study

RRsp Note: National Grid assumption based on regional PA working groups.

RRwp Source: NMR (2018). RLPNC 17-3 Smart Power Strip Metering Study

RRwp Note: National Grid assumption based on regional PA working groups.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Smart Strips	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Smart Strips	0.00	0.00	0.00	1.00

NTG Note: Realization rate is assumed 100% because energy savings are custom calculated.

TRC: $30.00 / measure

Incentive: $10.00 / measure

Tricklestar Keyboard

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Other | **Measure Type:** Tricklestar Keyboards | **Measure Sub Type:** Tricklestar Keyboard

Program: A04b Energy Star Products

Measure Description

The basic measures puts the PC/laptop to sleep when the user is absent from the PC.

Baseline Description

The baseline efficiency is using a normal keyboard.

Savings Principle

The high efficiency case is using a tricklestar keyboard .

Savings Method

Deemed

Unit

Per tricklestar keyboard

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Tricklestar Keyboard	105.0	0.0670	0.00	0.00	0.00	0.00	0.00

Electric kW Source: https://www.energuide.be/en/questions-answers/how-much-power-does-a-computer-use-and-how-much-co2-does-that-represent/54/

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Tricklestar Keyboard	5	0.81	1.00		0.92	0.92	0.92	0.58	0.86

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Tricklestar Keyboard	32.00%	35.00%	15.00%	18.00%

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Tricklestar Keyboard	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Tricklestar Keyboard	0.31	0.01	0.00	0.70

NTG Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

TRC: $99.90 / measure

Battery Storage

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Whole Home | **Measure Type:** Demand Response | **Measure Sub Type:** Whole Home

Program: Residential ConnectedSolutions

Measure Description

This is a Battery Storage program offering where during called events National Grid will discharge the customers battery during peak load times in order to reduce the system peak.

Baseline Description

No action taken for these customers

Savings Principle

Peak Demand savings are achieved by discharging the battery.

Savings Method

Deemed

Unit

Per demand response event

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Battery Storage	0	5.5000	0.00	0.00	0.00	0.00	0.00

Electric kW Source: 2019 Residential Energy Storage Demand Response Demonstration Evaluation (Summer Season)

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Battery Storage	1	1.00	1.00					1.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Battery Storage	0.00%	0.00%	0.00%	0.00%

Measure Life Source: 2019 Residential Energy Storage Demand Response Demonstration Evaluation (Summer Season)

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Battery Storage	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Battery Storage	0.00	0.00	0.00	1.00

TRC: $2,640.00 / Summer Net kW Savings

Incentive: $2,640.00 / Summer Net kW savings

Direct Load Control Thermostats Existing

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Demand Response | **Measure Sub Type:** Cooling

Program: Residential ConnectedSolutions

Measure Description

This is a Wi-Fi Direct load control program where during called events National Grid will adjust the thermostat down for a precooling set period and then back up above it's original setpoint during the event reducing the demand load during an event.

Baseline Description

No action taken for these customers

Savings Principle

Peak Demand savings are achieved by reducing these customers set points during peak times.

Savings Method

Deemed

Unit

Per demand response event

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Direct Load Control Thermostats Existing	8.5	0.5900	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: 2019 Residential Wi-Fi Thermostat Direct Load Control Offering Evaluation

Electric kWh Note: MA study avg kWh savings = 6,330 kWh/event; 0.85/thermostat/event. Here assume 10 events; annual savings = 8.48 kWh/thermostat.

Electric kW Source: 2019 Residential Wi-Fi Thermostat Direct Load Control Offering Evaluation

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Direct Load Control Thermostats Existing	1	1.00	1.00					1.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Direct Load Control Thermostats Existing	47.30%	42.20%	6.60%	3.80%

Measure Life Source: 2019 Residential Wi-Fi Thermostat Direct Load Control Offering Evaluation

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Direct Load Control Thermostats Existing	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Direct Load Control Thermostats Existing	0.00	0.00	0.00	1.00

TRC: $25.00 / thermostat

Incentive: $25.00 / thermostat

Direct Load Control Thermostats New

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Demand Response | **Measure Sub Type:** Cooling

Program: Residential ConnectedSolutions

Measure Description

This is a Wi-Fi Direct load control program where during called events National Grid will adjust the thermostat down for a precooling set period and then back up above it's original setpoint during the event reducing the demand load during an event.

Baseline Description

No action taken for these customers

Savings Principle

Peak Demand savings are achieved by reducing these customers set points during peak times.

Savings Method

Deemed

Unit

Per demand response event

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Direct Load Control Thermostats New	8.5	0.5900	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: 2019 Residential Wi-Fi Thermostat Direct Load Control Offering Evaluation

Electric kWh Note: MA study avg kWh savings = 6,330 kWh/event; 0.85/thermostat/event. Here assume 10 events; annual savings = 8.48 kWh/thermostat.

Electric kW Source: 2019 Residential Wi-Fi Thermostat Direct Load Control Offering Evaluation

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Direct Load Control Thermostats New	1	1.00	1.00					1.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Direct Load Control Thermostats New	47.30%	42.20%	6.60%	3.80%

Measure Life Source: 2019 Residential Wi-Fi Thermostat Direct Load Control Offering Evaluation

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Direct Load Control Thermostats New	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Direct Load Control Thermostats New	0.00	0.00	0.00	1.00

TRC: $45.00 / thermostat

Incentive: $45.00 / thermostat

Solar Inverters, Existing

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Controls | **Measure Type:** Demand Response | **Measure Sub Type:** Controls

Program: Residential ConnectedSolutions

Measure Description

This is a solar inverter program where during called events the solar inverter is to inject or absorb reactive power depending on local voltage and generation conditions.

Baseline Description

No action taken for these customers.

Savings Principle

Peak Demand savings are achieved by customers shifting load from peak times to off peak times.

Savings Method

Deemed

Unit

Installed existing solar inverter

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Solar Inverters, Existing	0.0	0.2750	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Solar Inverter Power Factor Correction Demonstration (MA21DR03) Evaluation Memorandum

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Solar Inverters, Existing	1	1.00	1.00					1.00	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Solar Inverters, Existing	30.50%	36.10%	15.20%	18.30%

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Solar Inverters, Existing	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Solar Inverters, Existing	0.00	0.00	0.00	1.00

TRC: $20.00 / solar inverter

Incentive: $20.00 / solar inverter

Solar Inverters, New

Sector: Residential | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Controls | **Measure Type:** Demand Response | **Measure Sub Type:** Controls

Program: Residential ConnectedSolutions

Measure Description

This is a solar inverter program where during called events the solar inverter is to inject or absorb reactive power depending on local voltage and generation conditions.

Baseline Description

No action taken for these customers

Savings Principle

Peak Demand savings are achieved by customers shifting load from peak times to off peak times.

Savings Method

Deemed

Unit

Installation of new solar inverter

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Solar Inverters, New	0.0	0.2750	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Solar Inverter Power Factor Correction Demonstration (MA21DR03) Evaluation Memorandum

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Solar Inverters, New	1	1.00	1.00					1.00	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Solar Inverters, New	30.50%	36.10%	15.20%	18.30%

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Solar Inverters, New	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Solar Inverters, New	0.00	0.00	0.00	1.00

TRC: $45.00 / solar inverter

Incentive: $45.00 / solar inverter

Boiler (Forced Hot Water) >= 95% AFUE

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Heating | **Measure Sub Type:** Boiler

Program: A02b Energy Star Heating System

Measure Description

Installation of a new space heating gas-fired condensing boiler.

Baseline Description

The end of life baseline efficiency case is a boiler with a rated AFUE equal to 86.5% and an actual efficiency of 83.7%. For the early retirement portion of the savings, the baseline efficiency is a rated 85.5% AFUE and an actual efficiency of 77.4%.

Savings Principle

The high efficiency case is a boiler with an AFUE greater than or equal to 90% or 95%.

Savings Method

Deemed

Unit

Installation of new high-efficiency boiler

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Boiler (Forced Hot Water) >= 95% AFUE	0	0.0000	10.70	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Guidehouse (2021). Comprehensive TRM Review/RI_2022 Annual Plan_Gas_HVAC_WH_Calculations_2021-06-10

Gas Heat MMBtu Note: Baseline update can be found in first source and calculations for savings can be found in second source.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Boiler (Forced Hot Water) >= 95% AFUE	18	1.00	1.00	1.00	1.00	1.00	1.00		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Boiler (Forced Hot Water) >= 95% AFUE	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review/RI_2022 Annual Plan_Gas_HVAC_WH_Calculations_2021-06-10

Measure Life Note: Baseline update can be found in first source and calculations for savings can be found in second source.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Boiler (Forced Hot Water) >= 95% AFUE	0.00	0.00	49.11	0

Annual $ Note: NEI per participant / treated unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Boiler (Forced Hot Water) >= 95% AFUE	0.36	0.13	0.00	0.76

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

TRC: $3,711.00 / measure

Incentive: $1,000.00 / measure

Boiler Reset Controls

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Boiler Control

Program: A02b Energy Star Heating System

Measure Description

Boiler reset controls are devices that improve the efficiency of an existing boiler system by modulating the hot water temperature set point. Reset controls automatically control boiler water temperature based on outdoor temperature using a software program; load controls sense the thermal demand of the heating system and resets the water temperature based on the demand.

Baseline Description

The baseline efficiency case is a boiler without reset or load controls.

Savings Principle

The efficient case is a boiler with reset or load controls, which reset the supply water temperature based on outdoor temperatures and/or building load.

Savings Method

Deemed

Unit

Installation of boiler reset control on existing boiler

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Boiler Reset Controls	0	0.0000	5.10	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Navigant (2018) Res 34 Home Energy Services Impact Evaluation

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Boiler Reset Controls	15	1.00	1.00	1.00	1.00	1.00	1.00		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Boiler Reset Controls	0.00%	0.00%	0.00%	0.00%

Measure Life Source: ACEEE (2006). Emerging Technologies Report: Advanced Boiler Controls. Prepared for ACEEE.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Boiler Reset Controls	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Boiler Reset Controls	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $300.00 / measure

Incentive: $225.00 / measure

Combo Furnace

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Heating | **Measure Sub Type:** Furnace

Program: A02b Energy Star Heating System

Measure Description

This measure promotes the installation of a combined condensing high-efficiency furnace and water heating unit. Combined furnace and water heating systems are more efficient than separate systems because they eliminate the standby heat losses of an additional tank.

Baseline Description

The baseline efficiency case is an 80% AFUE boiler with a 0.594 EF water heater.

Savings Principle

The high efficiency case is an integrated water heater/condensing furnace with a 95% AFUE boiler and a 0.95 EF water heater.

Savings Method

Deemed

Unit

Installation of new high-efficiency integrated furnace/water heater

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Combo Furnace	0	0.0000	15.10	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Combo Furnace	17	1.00	1.00	1.00	1.00	1.00	1.00		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Combo Furnace	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Combo Furnace	0.00	0.00	2.74	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Combo Furnace	0.36	0.13	0.00	0.76

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

TRC: $995.00 / measure

Incentive: $700.00 / measure

ENERGY STAR COND WATER HEATER 0.80 UEF

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Water Heater | **Measure Sub Type:** Condensing Water Heater

Program: A02b Energy Star Heating System

Measure Description

Condensing water heaters recover energy by using either a larger heat exchanger or a second heat exchanger to reduce the flue-gas temperature to the point that water vapor condenses, thus releasing even more energy.

Baseline Description

The baseline efficiency case is a standalone tank water heater with an UEF of 0.58 for medium draw and 0.63 for high draw of 0.61. For

Savings Principle

The high efficiency case is a stand-alone storage water heater with a medium draw and UEF >= 0.64 or high draw and UEF >= 0.68, a condensing water heater with an UEF >= 0.80, a tankless water heater with an UEF >= 0.87, or an indirect water heater attached to an ENERGY STAR® rated forced hot water gas boiler.

Savings Method

Deemed

Unit

Installation of new high-efficiency water heater

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
ENERGY STAR COND WATER HEATER 0.80 UEF	-43.0	-0.0200	0.00	7.00	0.00	0.00	0.00

Electric kWh Source: Water Heater UEF screening_2019-21_revised 2018.09.06

Electric kW Source: Water Heater UEF screening_2019-21_revised 2018.09.06

Gas DHW MMBtu Source: Water Heater UEF screening_2019-21_revised 2018.09.06

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
ENERGY STAR COND WATER HEATER 0.80 UEF	15	1.00	1.00	1.00	1.00	1.00	1.00	0.21	0.40

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
ENERGY STAR COND WATER HEATER 0.80 UEF	41.00%	34.00%	13.00%	12.00%

Measure Life Source: Water Heater UEF screening_2019-21_revised 2018.09.06

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
ENERGY STAR COND WATER HEATER 0.80 UEF	0.00	0.00	0.70	0

Annual $ Note: NEI per participant / treated unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
ENERGY STAR COND WATER HEATER 0.80 UEF	0.34	0.12	0.00	0.77

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

TRC: $1,285.00 / measure

Incentive: $250.00 / measure

ENERGY STAR ON DEMAND WATER HEATER 0.87 UEF

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Water Heater | **Measure Sub Type:** Tankless Water Heater

Program: A02b Energy Star Heating System

Measure Description

Condensing water tankless water heaters recover energy by using either a larger heat exchanger or a second heat exchanger to reduce the flue-gas temperature to the point that water vapor condenses, thus releasing even more energy and circulating water through a heat exchanger to be heated for immediate use, eliminating the standby heat loss associated with a storage tank.

Baseline Description

The baseline efficiency case is a high draw standalone tank water heater with an UEF of 0.63. For the early retirement portion, the UEF is equal to 0.60.

Savings Principle

The high efficiency case is a stand-alone storage water heater with a medium draw and UEF >= 0.64 or high draw and UEF >= 0.68, a condensing water heater with an UEF >= 0.80, a tankless water heater with an UEF >= 0.87, or an indirect water heater attached to an ENERGY STAR® rated forced hot water gas boiler.

Savings Method

Deemed

Unit

Installed condensing tankless water heater

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
ENERGY STAR ON DEMAND WATER HEATER 0.87 UEF	-43.0	-0.0200	0.00	7.00	0.00	0.00	0.00

Electric kWh Source: Water Heater UEF screening_2019-21_revised 2018.09.06

Electric kW Source: Water Heater UEF screening_2019-21_revised 2018.09.06

Gas DHW MMBtu Source: Guidehouse (2021). Comprehensive TRM Review/RI_2022 Annual Plan_Gas_HVAC_WH_Calculations_2021-06-10

Gas DHW MMBtu Note: Baseline update can be found in first source and calculations for savings can be found in second source.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
ENERGY STAR ON DEMAND WATER HEATER 0.87 UEF	19	1.00	1.00	1.00	1.00	1.00	1.00	0.21	0.40

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
ENERGY STAR ON DEMAND WATER HEATER 0.87 UEF	41.00%	34.00%	13.00%	12.00%

Measure Life Source: Water Heater UEF screening_2019-21_revised 2018.09.06

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
ENERGY STAR ON DEMAND WATER HEATER 0.87 UEF	0.00	0.00	1.23	0

Annual $ Note: NEI per participant / treated unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
ENERGY STAR ON DEMAND WATER HEATER 0.87 UEF	0.34	0.12	0.00	0.77

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

TRC: $718.00 / measure

Incentive: $600.00 / measure

ENERGY STAR STORAGE WATER HEATER .64 UEF (Med Draw)

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Water Heater | **Measure Sub Type:** Efficient Standard Tank Water Heater

Program: A02b Energy Star Heating System

Measure Description

Stand-alone storage water heaters are high efficiency water heaters that are not combined with space heating devices.

Baseline Description

The baseline efficiency case is a standalone tank water heater with a medium draw of a UEF of 0.58 and high draw of 0.63. For the early retirement portion, the medium draw UEF is equal to 0.56 and high draw is equal to 0.60.

Savings Principle

The high efficiency case is a stand-alone storage water heater with a medium draw and UEF >= 0.64 or high draw and UEF >= 0.68, a condensing water heater with an UEF >= 0.80, a tankless water heater with an UEF >= 0.87, or an indirect water heater attached to an ENERGY STAR® rated forced hot water gas boiler.

Savings Method

Deemed

Unit

Installation of new high-efficiency water heater

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
ENERGY STAR STORAGE WATER HEATER .64 UEF (Med Draw)	-43.0	-0.0200	0.00	2.50	0.00	0.00	0.00

Electric kWh Source: Water Heater UEF screening_2019-21_revised 2018.09.06

Electric kW Source: Water Heater UEF screening_2019-21_revised 2018.09.06

Gas DHW MMBtu Source: Guidehouse (2021). Comprehensive TRM Review/RI_2022 Annual Plan_Gas_HVAC_WH_Calculations_2021-06-10

Gas DHW MMBtu Note: Baseline update can be found in first source and calculations for savings can be found in second source.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
ENERGY STAR STORAGE WATER HEATER .64 UEF (Med Draw)	9	1.00	1.00	1.00	1.00	1.00	1.00	0.21	0.40

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
ENERGY STAR STORAGE WATER HEATER .64 UEF (Med Draw)	41.00%	34.00%	13.00%	12.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review/RI_2022 Annual Plan_Gas_HVAC_WH_Calculations_2021-06-10

Measure Life Note: Baseline update can be found in first source and calculations for savings can be found in second source.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
ENERGY STAR STORAGE WATER HEATER .64 UEF (Med Draw)	0.00	0.00	1.30	0

Annual $ Note: NEI per participant / treated unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
ENERGY STAR STORAGE WATER HEATER .64 UEF (Med Draw)	0.34	0.12	0.00	0.77

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

TRC: $165.00 / measure

Incentive: $125.00 / measure

ENERGY STAR STORAGE WATER HEATER .68 UEF (High Draw)

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Water Heater | **Measure Sub Type:** Efficient Standard Tank Water Heater

Program: A02b Energy Star Heating System

Measure Description

Stand-alone storage water heaters are high efficiency water heaters that are not combined with space heating devices.

Baseline Description

The baseline efficiency case is a standalone tank water heater with a medium draw of a UEF of 0.58 and high draw of 0.63. For the early retirement portion, the medium draw UEF is equal to 0.56 and high draw is equal to 0.60.

Savings Principle

The high efficiency case is a stand-alone storage water heater with a medium draw and UEF >= 0.64 or high draw and UEF >= 0.68, a condensing water heater with an UEF >= 0.80, a tankless water heater with an UEF >= 0.87, or an indirect water heater attached to an ENERGY STAR® rated forced hot water gas boiler.

Savings Method

Deemed

Unit

Installation of new high-efficiency water heater

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
ENERGY STAR STORAGE WATER HEATER .68 UEF (High Draw)	-43.0	-0.0200	0.00	2.50	0.00	0.00	0.00

Electric kWh Source: Water Heater UEF screening_2019-21_revised 2018.09.06

Electric kW Source: Water Heater UEF screening_2019-21_revised 2018.09.06

Gas DHW MMBtu Source: Guidehouse (2021). Comprehensive TRM Review/RI_2022 Annual Plan_Gas_HVAC_WH_Calculations_2021-06-10

Gas DHW MMBtu Note: Baseline update can be found in first source and calculations for savings can be found in second source.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
ENERGY STAR STORAGE WATER HEATER .68 UEF (High Draw)	9	1.00	1.00	1.00	1.00	1.00	1.00	0.21	0.40

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
ENERGY STAR STORAGE WATER HEATER .68 UEF (High Draw)	41.00%	34.00%	13.00%	12.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review/RI_2022 Annual Plan_Gas_HVAC_WH_Calculations_2021-06-10

Measure Life Note: Baseline update can be found in first source and calculations for savings can be found in second source.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
ENERGY STAR STORAGE WATER HEATER .68 UEF (High Draw)	0.00	0.00	1.30	0

Annual $ Note: NEI per participant / treated unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
ENERGY STAR STORAGE WATER HEATER .68 UEF (High Draw)	0.34	0.12	0.00	0.77

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

TRC: $165.00 / measure

Incentive: $125.00 / measure

Furnace (Forced Hot Air) >= 97% AFUE

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Heating | **Measure Sub Type:** Furnace

Program: A02b Energy Star Heating System

Measure Description

Installation of a new high efficiency space heating gas-fired furnace with an electronically commutated motor (ECM) for the fan.

Baseline Description

The end of life baseline efficiency case is a boiler with a rated AFUE equal to 89.0% and an actual efficiency of 90.1%. For the early retirement portion of the savings, the baseline efficiency is a rated 85.0% AFUE and an actual efficiency of 81.0%.

Savings Principle

The high efficiency case is a new furnace with AFUE >= 95% and an electronically commutated motor or a new furnace with AFUE >= 97% and an electronically commutated motor.

Savings Method

Deemed

Unit

Installation of new high-efficiency furnace with ECM

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Furnace (Forced Hot Air) >= 97% AFUE	0	0.0000	7.60	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Guidehouse (2021). Comprehensive TRM Review/RI_2022 Annual Plan_Gas_HVAC_WH_Calculations_2021-06-10

Gas Heat MMBtu Note: Baseline update can be found in first source and calculations for savings can be found in second source.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Furnace (Forced Hot Air) >= 97% AFUE	17	1.00	1.00	1.00	1.00	1.00	1.00		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Furnace (Forced Hot Air) >= 97% AFUE	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

Measure Life Note: Baseline update can be found in first source and calculations for savings can be found in second source.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Furnace (Forced Hot Air) >= 97% AFUE	0.00	0.00	47.16	0

Annual $ Note: NEI per participant / treated unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Furnace (Forced Hot Air) >= 97% AFUE	0.36	0.13	0.00	0.76

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

TRC: $1,851.00 / measure

Incentive: $600.00 / measure

Furnace (Forced Hot Air) 95% AFUE w/ECM

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Heating | **Measure Sub Type:** Furnace

Program: A02b Energy Star Heating System

Measure Description

Installation of a new high efficiency space heating gas-fired furnace with an electronically commutated motor (ECM) for the fan.

Baseline Description

The end of life baseline efficiency case is a boiler with a rated AFUE equal to 89.0% and an actual efficiency of 90.1%. For the early retirement portion of the savings, the baseline efficiency is a rated 85.0% AFUE and an actual efficiency of 81.0%.

Savings Principle

The high efficiency case is a new furnace with AFUE >= 95% and an electronically commutated motor or a new furnace with AFUE >= 97% and an electronically commutated motor.

Savings Method

Deemed

Unit

Installation of new high-efficiency furnace with ECM

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Furnace (Forced Hot Air) 95% AFUE w/ECM	0	0.0000	6.80	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Guidehouse (2021). Comprehensive TRM Review/RI_2022 Annual Plan_Gas_HVAC_WH_Calculations_2021-06-10

Gas Heat MMBtu Note: Baseline update can be found in first source and calculations for savings can be found in second source.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Furnace (Forced Hot Air) 95% AFUE w/ECM	17	1.00	1.00	1.00	1.00	1.00	1.00		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Furnace (Forced Hot Air) 95% AFUE w/ECM	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

Measure Life Note: Baseline update can be found in first source and calculations for savings can be found in second source.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Furnace (Forced Hot Air) 95% AFUE w/ECM	0.00	0.00	47.16	0

Annual $ Note: NEI per participant / treated unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Furnace (Forced Hot Air) 95% AFUE w/ECM	0.36	0.13	0.00	0.76

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

TRC: $1,536.00 / measure

Incentive: $350.00 / measure

Heat Recovery Ventilator

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Ventilation | **Measure Sub Type:** Heat Recovery Ventilator

Program: A02b Energy Star Heating System

Measure Description

Heat Recovery Ventilators (HRV) can help make mechanical ventilation more cost effective by reclaiming energy from exhaust airflows. An electric penalty results due to the increased electricity consumed by the system fans.

Baseline Description

The baseline efficiency case is an ASHRAE 62.2-compliant exhaust fan system with no heat recovery.

Savings Principle

The high efficiency case is an exhaust fan system with heat recovery.

Savings Method

Deemed

Unit

Installation of heat recovery ventilation system

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heat Recovery Ventilator	-171.0	-0.0200	8.60	0.00	0.00	0.00	0.00

Electric kWh Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

Electric kW Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

Gas Heat MMBtu Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heat Recovery Ventilator	20	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.45

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heat Recovery Ventilator	45.00%	55.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heat Recovery Ventilator	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heat Recovery Ventilator	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $960.00 / measure

Incentive: $500.00 / measure

Indirect Water Heater

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Water Heater | **Measure Sub Type:** Indirect Water Heater

Program: A02b Energy Star Heating System

Measure Description

Installation of high efficiency gas water heaters: Indirect water heaters use storage tank that is heated by the main boiler. The energy stored by the water tank allows the boiler to turn off and on less often, saving considerable energy. Condensing waterheaters recover energy by using either a larger heat exchanger or a second heat exchanger to reduce the flue-gas temperature to the point that water vapor condenses, thus releasing even more energy. Stand-alone storage water heaters are high efficiency water heaters that are not combined with space heating devices. Tankless water heaters circulate water through a heat exchanger to be heated for immediate use, eliminating the standby heat loss associated with a storage tank.

Baseline Description

The baseline efficiency case is a standalone tank water heater with an energy factor of 0.61.

Savings Principle

The high efficiency case is a stand-alone storage water heater with a medium draw and UEF >= 0.64 or high draw and UEF >= 0.68, a condensing water heater with an UEF >= 0.80, a tankless water heater with an UEF >= 0.87, or an indirect water heater attached to an ENERGY STAR® rated forced hot water gas boiler.

Savings Method

Deemed

Unit

Installation of new high-efficiency water heater

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Indirect Water Heater	0	0.0000	4.00	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Navigant (2018) Res 34 Home Energy Services Impact Evaluation

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Indirect Water Heater	20	1.00	1.00	1.00	1.00	1.00	1.00		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Indirect Water Heater	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Indirect Water Heater	0.00	0.00	0.70	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Indirect Water Heater	0.34	0.12	0.00	0.77

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

TRC: $1,749.00 / measure

Incentive: $425.00 / measure

Integrated Water Heater/Condensing Boiler 95

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Heating | **Measure Sub Type:** Boiler

Program: A02b Energy Star Heating System

Measure Description

This measure promotes the installation of a combined condensing high-efficiency boiler and water heating unit. Combined boiler and water heating systems are more efficient than separate systems because they eliminate the standby heat losses of an additional tank.

Baseline Description

For heating, the end of life baseline efficiency case is a 86.5% rated with an actual efficiency of 83.7%. For the early retirement portion, the baseline efficiency has a rated AFUE of 85.5 with a 77.4% actual AFUE Efficiency. For water heating, there isa blend of 24% indirect water heater and 76% storage water heater.

Savings Principle

The high efficiency case is an integrated water heater/condensing boiler with a 95% AFUE boiler and a 0.95 EF water heater.

Savings Method

Deemed

Unit

Installation of new high-efficiency integrated boiler/water heater

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Integrated Water Heater/Condensing Boiler 95	0	0.0000	11.70	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Guidehouse (2021). Comprehensive TRM Review/RI_2022 Annual Plan_Gas_HVAC_WH_Calculations_2021-06-10

Gas Heat MMBtu Note: Baseline update can be found in first source and calculations for savings can be found in second source.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Integrated Water Heater/Condensing Boiler 95	23	1.00	1.00	1.00	1.00	1.00	1.00		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Integrated Water Heater/Condensing Boiler 95	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Integrated Water Heater/Condensing Boiler 95	0.00	0.00	2.74	0

Annual $ Note: NEI per participant / treated unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Integrated Water Heater/Condensing Boiler 95	0.36	0.13	0.00	0.76

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

TRC: $3,751.00 / measure

Incentive: $1,400.00 / measure

LOW_FLOW_SHOWERHEAD

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Water Heater | **Measure Sub Type:** Low Flow Showerhead

Program: A02b Energy Star Heating System

Measure Description

1.75 GPD or less

Baseline Description

Standard Showerhead

Savings Principle

Savings Method

Deemed

Unit

Per Showerhead

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
LOW_FLOW_SHOWERHEAD	0	0	0.00	1.20	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
LOW_FLOW_SHOWERHEAD	15	0.78	1.00	1.00	1.00	1.00	1.00		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
LOW_FLOW_SHOWERHEAD	0.00%	0.00%	0.00%	0.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
LOW_FLOW_SHOWERHEAD	2401.00	2401.00	0	0.03

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
LOW_FLOW_SHOWERHEAD	0.03	0.12	0.00	1.09

NTG Source: Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado

TRC: $20.00 / measure

Incentive: $7.00 / measure

Programmable Thermostat

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: A02b Energy Star Heating System

Measure Description

Installation of a programmable thermostat which gives the ability to adjust heating or air-conditioning operating times according to a pre-set schedule.

Baseline Description

The baseline efficiency case for cooling is a manual thermostat.

Savings Principle

Savings Method

Deemed

Unit

Per Thermostat

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Programmable Thermostat	0	0.0000	2.07	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: MA Smart Thermostat Impact Study (RES 24) - Final Results

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Programmable Thermostat	19	1.00	1.00	1.00	1.00	1.00	1.00		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Programmable Thermostat	0.00%	0.00%	0.00%	0.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Programmable Thermostat	0.00	0.00	4.19	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Programmable Thermostat	0.25	0.12	0.00	0.87

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

TRC: $92.00 / measure

Incentive: $25.00 / measure

Thermostatic Shut-Off Valve

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Water Heater | **Measure Sub Type:** Low Flow Showerhead

Program: A02b Energy Star Heating System

Measure Description

TSV

Baseline Description

Standard Showerhead

Savings Principle

Savings Method

Deemed

Unit

Per Showerhead

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Thermostatic Shut-Off Valve	0	0	0.00	0.38	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Thermostatic Shut-Off Valve	15	0.78	1.00	1.00	1.00	1.00	1.00		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Thermostatic Shut-Off Valve	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Thermostatic Shut-Off Valve	621.00	621.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Thermostatic Shut-Off Valve	0.03	0.12	0.00	1.09

NTG Source: Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado

TRC: $21.00 / measure

Incentive: $11.50 / measure

Triple Pane Windows

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, triple pane

Program: A02b Energy Star Heating System

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Triple Pane Windows	7.0	0.0100	0.60	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Gas Heat MMBtu Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Triple Pane Windows	14	1.00	1.00		1.00	1.00	1.00	0.37	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Triple Pane Windows	4.00%	4.00%	50.00%	43.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Triple Pane Windows	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Triple Pane Windows	0.04	0.00	0.00	0.96

NTG Source: MA 2022 TRM

TRC: $251.00 / measure

Incentive: $75.00 / measure

TSV_SHOWERHEAD

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Water Heater | **Measure Sub Type:** Low Flow Showerhead

Program: A02b Energy Star Heating System

Measure Description

TSV + 1.75 GPD or less

Baseline Description

Standard Showerhead

Savings Principle

Savings Method

Deemed

Unit

Per Showerhead

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
TSV_SHOWERHEAD	0	0	0.00	1.22	0.00	0.00	0.00

Gas DHW MMBtu Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
TSV_SHOWERHEAD	15	0.78	1.00	1.00	1.00	1.00	1.00		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
TSV_SHOWERHEAD	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
TSV_SHOWERHEAD	3022.00	3022.00	0	0.03

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
TSV_SHOWERHEAD	0.03	0.12	0.00	1.09

NTG Source: Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado

TRC: $32.00 / measure

Incentive: $15.00 / measure

WiFi Enabled Thermostat

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: A02b Energy Star Heating System

Measure Description

Installation of a programmable thermostat which gives the ability to adjust heating or air-conditioning operating times according to a pre-set schedule.

Baseline Description

For the installation of a programmable thermostat, the baseline efficiency case is an HVAC system using natural gas to provide space heating without a programmable thermostat. For the installation of a wi-fi programmable thermostat, the baseline efficiency case is an HVAC system using natural gas to provide space heating with a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system that has a programmable thermostat or wi-fi programmable thermostat installed.

Savings Method

Deemed

Unit

Installation of programmable thermostat

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
WiFi Enabled Thermostat	0	0.0000	2.79	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: MA Smart Thermostat Impact Study (RES 24) - Final Results

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
WiFi Enabled Thermostat	15	1.00	1.00	1.00	1.00	1.00	1.00		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
WiFi Enabled Thermostat	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Environmental Protection Agency (2010). Life Cycle Cost Estimate for Programmable Thermostats. Accessed on 10/12/2011.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
WiFi Enabled Thermostat	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
WiFi Enabled Thermostat	0.25	0.12	0.00	0.87

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

WiFi Enabled Thermostat with Cooling

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: A02b Energy Star Heating System

Measure Description

Installation of a programmable thermostat which gives the ability to adjust heating or air-conditioning operating times according to a pre-set schedule.

Baseline Description

For the installation of a programmable thermostat, the baseline efficiency case is an HVAC system using natural gas to provide space heating without a programmable thermostat. For the installation of a wi-fi programmable thermostat, the baseline efficiency case is an HVAC system using natural gas to provide space heating with a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system that has a programmable thermostat or wi-fi programmable thermostat installed.

Savings Method

Deemed

Unit

Installation of programmable thermostat

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
WiFi Enabled Thermostat with Cooling	18.0	0.0300	2.79	0.00	0.00	0.00	0.00

Electric kWh Source: Wi-Fi-Thermostat-Impact-Evaluation-Secondary-Literature-Study_FINAL

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Gas Heat MMBtu Source: MA Smart Thermostat Impact Study (RES 24) - Final Results

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
WiFi Enabled Thermostat with Cooling	15	1.00	1.00	1.00	1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
WiFi Enabled Thermostat with Cooling	47.00%	42.00%	7.00%	4.00%

Measure Life Source: Environmental Protection Agency (2010). Life Cycle Cost Estimate for Programmable Thermostats. Accessed on 10/12/2011.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
WiFi Enabled Thermostat with Cooling	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
WiFi Enabled Thermostat with Cooling	0.25	0.12	0.00	0.87

NTG Source: NMR Group, Inc (2021). MA20R28-B-RCD and Selected Products NTG

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $268.00 / measure

Incentive: $75.00 / measure

Air Sealing

Sector: Residential	**Fuel:** Gas	**Program Type:** Custom
Measure Category: Building Shell	**Measure Type:** Air Sealing	**Measure Sub Type:** Air Sealing/Infiltration

Program: A03b EnergyWise Multifamily

Measure Description

Thermal shell air leaks are sealed through strategic use and location of air-tight materials.

Baseline Description

The baseline efficiency case is the existing building before the air sealing measure is implemented. The baseline building is characterized by the existing CFM50 measurement (CFM50PRE) for single family homes, or the existing air changes per hour (ACHPRE)

Savings Principle

The high efficiency case is the existing building after the air sealing measure is implemented. The high efficiency building is characterized by the new CFM50 measurement for single family homes (CFM50POST), or the new air changes per hour (ACHPOST) for multi-family facilities, which is measured after the air sealing measure is implemented.

Savings Method

Calculated using site-specific inputs

Unit

Completed air sealing project.

Savings Equation

Gross MMBtu Gas = (CFM50_pre - CFM50_post) / LBL × HDD × (Hours per Day) × (Minutes per Hour) × (Btu/ft3-°F) × CorrectionFactor / SeasonalEff / (Btu per MMBtu)

Where:

CFM50_pre = CFM50 measurement before air sealing

CFM50_post = CFM50 measurement after air sealing (cu.ft./min)

LBL = LBL factor - This factor is determined as the product of the N-factor and a Height Correction Factor according to BPI Protocol

4644 HDD = Heating degree days (deg. F-day); This value is an average BASE 60 Annual Heating Degree Day value for weather stations in Rhode Island and southeastern Massachusetts based on NOAA 30-year data. http://www.ncdc.noaa.gov

24 Hours per Day = Conversion factor

60 Minutes per Hour = Conversion factor

0.018 Btu/ft3-°F = Heat capacity of 1 cubic foot of air at 70 °F

1 CorrectionFactor = Correction factor determined by auditor (e.g. for seasonal homes): Default

0.7 SeasonalEff = Heating system seasonal efficiency factor determined by auditor for homes heated with natural gas: Default

1,000,000 Btuper MMBtu = Conversion factor

Hours: 4,644.0.

Hours Source: NOAA Weather data: An average BASE 60 Annual Heating Degree Day value for weather stations in Rhode Island and southeastern Massachusetts based on NOAA 30-year data.

Hours Note: Heating hours are characterized by the heating degree days for the facility, 4644.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Air Sealing	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for the Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Air Sealing	20	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Air Sealing	0.00%	0.00%	0.00%	0.00%

Measure Life Source: 'ComEd Effective Useful Life Research Report', May 2018

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Air Sealing	0.00	0.00	19.35	135.83

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Air Sealing	0.33	0.01	0.00	0.68

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Custom

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Custom | **Measure Sub Type:** Custom

Program: A03b EnergyWise Multifamily

Measure Description

Vendors install a variety of measures at multifamily facilities. Includes non-lighting multifamily measures.

Baseline Description

For retrofit projects, the baseline efficiency case is the same as the existing, or pre-retrofit, case for the non-lighting multifamily measures.

Savings Principle

The high efficiency scenario is specific to the facility and may include one or more energy efficiency.

Savings Method

Calc

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Custom	Calc	Calc	Calc	Calc	Calc	0.00	0.00

Gas Heat MMBtu Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Custom	multi	1.00	1.00	0.99	0.99			Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Custom	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Custom	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Custom	0.00	0.00	0.00	1.00

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Demand Circulator

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Demand Circulator

Program: A03b EnergyWise Multifamily

Measure Description

Installation of a demand controller on a re-circulation loop.

Baseline Description

Full time operation of re-circ pump.

Savings Principle

The re-circulation pump is controlled by a demand signal or timer to reduce operating hours when no hot water usage occurs.

Savings Method

Calc

Unit

Installed recirculation controller

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Demand Circulator	0	0	Calc	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Demand Circulator	15	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Demand Circulator	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Demand Circulator	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Demand Circulator	0.00	0.00	0.00	1.00

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Duct Sealing

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: HVAC | **Measure Type:** Ducting | **Measure Sub Type:** Duct Sealing

Program: A03b EnergyWise Multifamily

Measure Description

Ducts are sealed by reconnecting disconnected duct joints and sealing gaps or seams with mastic and fiber-mesh tape as appropriate.

Baseline Description

The baseline efficiency case is the existing facility or equipment prior to the implementation of duct sealing.

Savings Principle

The baseline efficiency case is the existing facility or equipment after the implementation of duct sealing.

Savings Method

Calc

Unit

Installation of duct sealing

Savings Equation

MMBtu = Annualheatingconsumption x %SAVE x (1/1000000)

Where:

AnnualHeatingConsumption = The total annual heating consumption for the facility (Btu)

%SAVE = Average reduction in energy consumption.

1/1,000,000 = Conversion from Btu to MMBtu

Savings Factors for Multifamily Duct Sealing

Measure Type %SAVE158

Savings Factors for Multifamily Duct Sealing

Surface Area < 50 SQFT 7%

Surface Area > 50 SQFT and < 200 SQFT 3%

Surface Area > 200 SQFT 1%

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Duct Sealing	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Duct Sealing	20	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Duct Sealing	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Duct Sealing	0.00	0.00	0.23	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Duct Sealing	0.33	0.01	0.00	0.68

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Faucet Aerator

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Faucet Aerator

Program: A03b EnergyWise Multifamily

Measure Description

Installation of a faucet aerator with a flow rate of 1.5 GPM or less on an existing faucet with high flow in a commercial setting with service water heated by natural gas.

Baseline Description

The baseline efficiency case is 2.2 GPM or greater faucet.

Savings Principle

The high efficiency case is a faucet with 1.5 GPM or less aerator installed.

Savings Method

Deemed

Unit

Installed faucet aerator.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Faucet Aerator	0	0	0.00	0.20	0.00	0.00	0.00

Gas DHW MMBtu Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Faucet Aerator	7	0.90	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Faucet Aerator	0.00%	0.00%	0.00%	0.00%

Measure Life Source: The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for the Massachusetts Program Administrators.

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Faucet Aerator	359.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Faucet Aerator	0.08	0.01	0.00	0.93

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Low-Flow showerhead

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: A03b EnergyWise Multifamily

Measure Description

Installation of a low flow showerhead with a flow rate of 1.5 GPM or less.

Baseline Description

The baseline efficiency case is a showerhead with a flow of 2.5 gpm. For home audit applications, the baseline is the existing showerhead.

Savings Principle

The high efficiency is a low-flow showerhead with a flow of 1.5 gpm or less.

Savings Method

Deemed

Unit

Installed low-flow showerhead

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low-Flow showerhead	0	0	0.00	1.30	0.00	0.00	0.00

Gas DHW MMBtu Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low-Flow showerhead	15	0.90	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low-Flow showerhead	0.00%	0.00%	0.00%	0.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low-Flow showerhead	1786.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low-Flow showerhead	0.08	0.01	0.00	0.93

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Low-Flow Showerhead Thermo Control (Ladybug Gas DHW)

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: A03b EnergyWise Multifamily

Measure Description

A showerhead with a control that limits flow once water is heated.

Baseline Description

The baseline case is a showerhead with a flow of 2.5 gallons per minute, or for the case of the adapter, a low flow showerhead with flow of 1.5 gpm or less.

Savings Principle

The high efficiency is a low-flow showerhead with a control that limits flow once the water is heated.

Savings Method

Deemed

Unit

Installed low-flow showerhead

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low-Flow Showerhead Thermo Control (Ladybug Gas DHW)	0	0	0.00	0.34	0.00	0.00	0.00

Gas DHW MMBtu Source: National Grid (2014). Review of ShowerStart evolve.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low-Flow Showerhead Thermo Control (Ladybug Gas DHW)	15	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low-Flow Showerhead Thermo Control (Ladybug Gas DHW)	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: National Grid assumption based on regional PA working groups.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low-Flow Showerhead Thermo Control (Ladybug Gas DHW)	558.00	0.00	0	0

Water/Sewer Source: National Grid (2014). Review of ShowerStart evolve.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low-Flow Showerhead Thermo Control (Ladybug Gas DHW)	0.08	0.01	0.00	0.93

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Low-Flow Showerhead with Thermo Control (Roadrunner Gas DHW)

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: A03b EnergyWise Multifamily

Measure Description

A showerhead with a control that limits flow once water is heated.

Baseline Description

The baseline case is a showerhead with a flow of 2.5 gallons per minute, or for the case of the adapter, a low flow showerhead with flow of 1.5 gpm or less.

Savings Principle

The high efficiency is a low-flow showerhead with a control that limits flow once the water is heated.

Savings Method

Deemed

Unit

Installed low-flow showerhead

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low-Flow Showerhead with Thermo Control (Roadrunner Gas DHW)	0	0	0.00	1.60	0.00	0.00	0.00

Gas DHW MMBtu Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low-Flow Showerhead with Thermo Control (Roadrunner Gas DHW)	15	0.90	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low-Flow Showerhead with Thermo Control (Roadrunner Gas DHW)	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: National Grid assumption based on regional PA working groups.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low-Flow Showerhead with Thermo Control (Roadrunner Gas DHW)	2254.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low-Flow Showerhead with Thermo Control (Roadrunner Gas DHW)	0.08	0.01	0.00	0.93

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

MF Shell Insulation

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Building Shell | **Measure Type:** Insulation | **Measure Sub Type:** Shell

Program: A03b EnergyWise Multifamily

Measure Description

Insulation upgrades are applied in existing multifamily facilities.

Baseline Description

The baseline efficiency case is characterized by the total R-value of the existing attic, basement or sidewall (Rexisit). This is calculated as the R-value of the existing insulation, estimated by the program contractor, plus the R-value of the ceiling, floor, or wall (for all projects: RCEILING = 3.36; RFLOOR = 6.16; RWALL = 6.65)

Savings Principle

The high efficiency case is characterized by the total R-value of the attic after the installation of additional attic, basement or sidewall insulation. This is calculated as the sum of the existing R-value (RBASE) plus the R-value of the added insulation(RADD).

Savings Method

Calculated using site-specific inputs

Unit

Completed insulation project.

Savings Equation

MMBTUannual = (((1/Rexist)-(1/Rnew)) x HDD x 24 x Area) / (1,000,000) X Nheat

kWhannual = MMBtuannaul x 293.1

kW = kWhannual x kW/kWh heating

Where:

Rexist = Existing effective R-value (R-ExistingInsulation + R-Assembly), ft2-°F/Btuh

Rnew = New total effective R-value (R-ProposedMeasure + R-ExistingInsulation + R-Assembly), ft2-°F/Btuh

Area = Square footage of insulated area

ηheat = Efficiency of the heating system (AFUE or COP)

293.1 = Conversion constant (1MMBtu = 293.1 kWh)

24 = Conversion for hours per day

HDD = Heating Degree Days; dependent on location, see table below

1,000,000 = Conversion from Btu to MMBtu

kW/kWh heating = Average annual kW reduction per kWh reduction: 0.00050 kW/kWh

Hours: 4,644.0.

Hours Source: NOAA Weather data: An average BASE 60 Annual Heating Degree Day value for weather stations in Rhode Island and southeastern Massachusetts based on NOAA 30-year data.

Hours Note: Heating hours are characterized by the heating degree days for the facility, 4644.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
MF Shell Insulation	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for the Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
MF Shell Insulation	25	1.00	1.00	1.00	1.00			0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
MF Shell Insulation	6.59%	3.85%	47.32%	42.24%

Measure Life Source: The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for the Massachusetts Program Administrators.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
MF Shell Insulation	0.00	0.00	47.31	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
MF Shell Insulation	0.33	0.01	0.00	0.68

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Participant

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Participant | **Measure Type:** Participant | **Measure Sub Type:** EW MF

Program: A03b EnergyWise Multifamily

Measure Description

This row identifies a participant for tracking and cost purposes.

Baseline Description

Savings Principle

Savings Method

Unit

Per participant

Savings Equation

N/A

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Participant	0	0	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Participant	20	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Participant	0.00%	0.00%	0.00%	0.00%

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Participant	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Participant	0.00	0.00	0.00	1.00

TRC: $390.00 / participant

Incentive: $304.00 / participant

Pipe Wrap (Water Heating)

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Insulation | **Measure Sub Type:** Pipe Insulation

Program: A03b EnergyWise Multifamily

Measure Description

Installation of DHW pipe wraps.

Baseline Description

The baseline efficiency case is the existing hot water equipment.

Savings Principle

The high efficiency case includes pipe wrap.

Savings Method

Deemed

Unit

Installed pipe wrap job

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Pipe Wrap (Water Heating)	0	0	0.00	0.15	0.00	0.00	0.00

Gas DHW MMBtu Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Gas DHW MMBtu Note: 3 feet per piece

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Pipe Wrap (Water Heating)	15	0.90	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Pipe Wrap (Water Heating)	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Pipe Wrap (Water Heating)	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Pipe Wrap (Water Heating)	0.08	0.01	0.00	0.93

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Programmable Thermostat

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: A03b EnergyWise Multifamily

Measure Description

Installation of a programmable thermostat which gives the ability to adjust heating or air-conditioning operating times according to a pre-set schedule.

Baseline Description

For the installation of a programmable thermostat, the baseline efficiency case is an HVAC system using natural gas to provide space heating without a programmable thermostat. For the installation of a wi-fi programmable thermostat, the baseline efficiency case is an HVAC system using natural gas to provide space heating with a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system that has a programmable thermostat or wi-fi programmable thermostat installed.

Savings Method

Deemed

Unit

Installation of programmable thermostat

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Programmable Thermostat	29.0	0.0461	1.50	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Gas Heat MMBtu Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Programmable Thermostat	13	0.95	1.00	1.00	1.00			0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Programmable Thermostat	6.59%	3.85%	47.32%	42.24%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Programmable Thermostat	0.00	0.00	14.35	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Programmable Thermostat	0.48	0.01	0.00	0.53

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Wi-Fi Programmable Tstat (Controls Gas Heat Only)

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: A03b EnergyWise Multifamily

Measure Description

Installation of a programmable thermostat which gives the ability to adjust heating or air-conditioning operating times according to a pre-set schedule.

Baseline Description

For the installation of a programmable thermostat, the baseline efficiency case is an HVAC system using natural gas to provide space heating without a programmable thermostat. For the installation of a wi-fi programmable thermostat, the baseline efficiency case is an HVAC system using natural gas to provide space heating with a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system that has a programmable thermostat or wi-fi programmable thermostat installed.

Savings Method

Deemed

Unit

Installation of programmable thermostat

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Wi-Fi Programmable Tstat (Controls Gas Heat Only)	31.0	0.0493	2.30	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Gas Heat MMBtu Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Wi-Fi Programmable Tstat (Controls Gas Heat Only)	15	0.95	1.00	1.00	1.00			0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Wi-Fi Programmable Tstat (Controls Gas Heat Only)	6.59%	3.85%	47.32%	42.24%

Measure Life Source: Environmental Protection Agency (2010). Life Cycle Cost Estimate for Programmable Thermostats. Accessed on 10/12/2011.

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Wi-Fi Programmable Tstat (Controls Gas Heat Only)	0.00	0.00	14.35	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Wi-Fi Programmable Tstat (Controls Gas Heat Only)	0.48	0.01	0.00	0.53

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: EW MF Bundled costs (see Participant listing)

Incentive: EW MF Bundled costs (see Participant listing)

Home Energy Report, Existing Dual Fuel

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Whole Home | **Measure Type:** Behavior | **Measure Sub Type:** Home Energy Reports

Program: Behavior

Measure Description

A Home Energy report sent to electric and gas customers that displays home energy consumption in comparison with peers and prompts energy conserving behavior.

Baseline Description

No Home Energy Report.

Savings Principle

A home that receives Home Energy Reports.

Savings Method

Calculated by comparing consumption of treatment (with reports) and control groups (no reports)

Unit

Per participant

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Home Energy Report, Existing Dual Fuel	0	0	Calc	0.00	0.00	0.00	0.00

Gas Heat MMBtu Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Home Energy Report, Existing Dual Fuel	1	1.00	1.00	0.92					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Home Energy Report, Existing Dual Fuel	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Opinion Dynamics with Navigant Consulting (2012). Massachusetts Three Year Cross-Cutting Behavioral Program Evaluation Integrated Report July 2012. Prepared for Massachusetts EEAC & Behavioral Research Team

ISR Source: RHODE ISLAND HOME ENERGY REPORT PROGRAM IMPACT AND PROCESS EVALUATION

ISR Note: In-service rates are set to 100% because savings represent average for all treatment household (including opt outs).

SPF Note: Savings persistence is 100% since measure life is 1 year.

RRe Source: Cadeo/Illume (2020). 2017-2019 Impact Evaluation of the Home Energy Reports Program

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Home Energy Report, Existing Dual Fuel	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Home Energy Report, Existing Dual Fuel	0.00	0.00	0.00	1.00

NTG Note: Net-t-gross is set to 100% since the HER program is implemented as a randomized control trial (RCT). RCT produces net savings accounting for free-ridership.

TRC: $2.78 / participant

Incentive: $2.78 / participant

Home Energy Report, Existing Gas

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Whole Home | **Measure Type:** Behavior | **Measure Sub Type:** Home Energy Reports

Program: Behavior

Measure Description

A Home Energy report sent to gas customers that displays home energy consumption in comparison with peers and prompts energy conserving behavior.

Baseline Description

No Home Energy Report.

Savings Principle

A home that receives Home Energy Reports.

Savings Method

Calculated by comparing consumption of treatment (with reports) and control groups (no reports)

Unit

Per participant

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Home Energy Report, Existing Gas	0	0	Calc	0.00	0.00	0.00	0.00

Gas Heat MMBtu Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Home Energy Report, Existing Gas	1	1.00	1.00	0.92					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Home Energy Report, Existing Gas	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Opinion Dynamics with Navigant Consulting (2012). Massachusetts Three Year Cross-Cutting Behavioral Program Evaluation Integrated Report July 2012. Prepared for Massachusetts EEAC & Behavioral Research Team

ISR Source: RHODE ISLAND HOME ENERGY REPORT PROGRAM IMPACT AND PROCESS EVALUATION

ISR Note: In-service rates are set to 100% because savings represent average for all treatment household (including opt outs).

SPF Note: Savings persistence is 100% since measure life is 1 year.

RRe Source: Cadeo/Illume (2020). 2017-2019 Impact Evaluation of the Home Energy Reports Program

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Home Energy Report, Existing Gas	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Home Energy Report, Existing Gas	0.00	0.00	0.00	1.00

NTG Note: Net-t-gross is set to 100% since the HER program is implemented as a randomized control trial (RCT). RCT produces net savings accounting for free-ridership.

TRC: $2.78 / participant

Incentive: $2.78 / participant

Home Energy Report, New Movers Dual Fuel

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Whole Home | **Measure Type:** Behavior | **Measure Sub Type:** Home Energy Reports

Program: Behavior

Measure Description

A Home Energy report sent to electric and gas customers that displays home energy consumption in comparison with peers and prompts energy conserving behavior.

Baseline Description

No Home Energy Report.

Savings Principle

A home that receives Home Energy Reports.

Savings Method

Calculated by comparing consumption of treatment (with reports) and control groups (no reports)

Unit

Per participant

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Home Energy Report, New Movers Dual Fuel	0	0	Calc	0.00	0.00	0.00	0.00

Gas Heat MMBtu Note: Supplied by vendor

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Home Energy Report, New Movers Dual Fuel	1	1.00	1.00	0.50					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Home Energy Report, New Movers Dual Fuel	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Opinion Dynamics with Navigant Consulting (2012). Massachusetts Three Year Cross-Cutting Behavioral Program Evaluation Integrated Report July 2012. Prepared for Massachusetts EEAC & Behavioral Research Team

ISR Source: RHODE ISLAND HOME ENERGY REPORT PROGRAM IMPACT AND PROCESS EVALUATION

ISR Note: In-service rates are set to 100% because savings represent average for all treatment household (including opt outs).

SPF Note: Savings persistence is 100% since measure life is 1 year.

RRe Source: Cadeo/Illume (2020). 2017-2019 Impact Evaluation of the Home Energy Reports Program

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Home Energy Report, New Movers Dual Fuel	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Home Energy Report, New Movers Dual Fuel	0.00	0.00	0.00	1.00

NTG Note: Net-t-gross is set to 100% since the HER program is implemented as a randomized control trial (RCT). RCT produces net savings accounting for free-ridership.

TRC: $2.78 / participant

Incentive: $2.78 / participant

Aerator

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Aerator

Program: Energy Wise Single Family

Measure Description

Installation of a faucet aerator with a flow rate of 1.5 GPM or less on an existing faucet with high flow in a residential setting with service water heated by gas.

Baseline Description

The baseline efficiency case is 2.2 GPM or greater flow rate.

Savings Principle

The high efficiency case is a faucet with 1.5 GPM or less installed.

Savings Method

Deemed

Unit

Installed aerator

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Aerator	0	0	0.00	0.14	0.00	0.00	0.00

Gas DHW MMBtu Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Aerator	7	0.98	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Aerator	0.00%	0.00%	0.00%	0.00%

Measure Life Note: Massachusetts Common Assumption

ISR Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

ISR Note: For mailed-in faucet aerators, ISR is assumed at 59% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: DNV GL RI EnergyWise Single Family Evaluation, July 2016

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Aerator	296.00	0.00	0	0

Water/Sewer Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Aerator	0.27	0.01	0.04	0.78

NTG Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

TRC: $7.00 / unit

Incentive: $7.00 / unit

Air Sealing Kit, Gas

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Air Sealing | **Measure Sub Type:** Air Sealing/Infiltration

Program: Energy Wise Single Family

Measure Description

The installation of recessed lighting cans that provide air sealing benefits.

Baseline Description

The baseline is leaky recessed lighting cans.

Savings Principle

The high efficiency case is the existing building after the air sealing measure is implemented.

Savings Method

Deemed

Unit

Installed kit

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Air Sealing Kit, Gas	0	0	0.37	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Air Sealing Kit, Gas	12	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Air Sealing Kit, Gas	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Rise Engineering (2015). Memo on Pilot Findings for LED inserts for Recessed Light Cans.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: DNV GL RI EnergyWise Single Family Evaluation, July 2016

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Air Sealing Kit, Gas	0.00	0.00	2.34	16.45

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

One-time $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Air Sealing Kit, Gas	0.00	0.00	0.04	1.04

NTG Source: Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado

Pipe Wrap

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Insulation | **Measure Sub Type:** Pipe Insulation

Program: Energy Wise Single Family

Measure Description

Installation of insulation to reduce water heating energy.

Baseline Description

The baseline case is uninsulated heated water pipes.

Savings Principle

The high efficiency case is the installation of high-efficiency domestic hot water equipment such as low-flow showerheads and faucet aerators.

Savings Method

Deemed

Unit

Installed pipe wrap

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Pipe Wrap	0	0	0.00	0.30	0.00	0.00	0.00

Gas DHW MMBtu Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Pipe Wrap	7	0.98	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Pipe Wrap	0.00%	0.00%	0.00%	0.00%

Measure Life Note: Massachusetts Common Assumption

ISR Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: DNV GL RI EnergyWise Single Family Evaluation, July 2016

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Pipe Wrap	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Pipe Wrap	0.27	0.01	0.04	0.78

NTG Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

TRC: $13.00 / unit

Incentive: $13.00 / unit

Programmable Thermostat

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: Energy Wise Single Family

Measure Description

Installation of a programmable thermostat which gives the ability to adjust heating or air-conditioning operating times according to a pre-set schedule.

Baseline Description

For the installation of a programmable thermostat, the baseline efficiency case is an HVAC system using natural gas to provide space heating without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system with a programmable thermostat installed.

Savings Method

Deemed

Unit

Installation of programmable thermostat

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Programmable Thermostat	27.0	0.0430	2.07	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Gas Heat MMBtu Source: MA Smart Thermostat Impact Study (RES 24) - Final Results

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Programmable Thermostat	19	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Programmable Thermostat	7.00%	3.80%	47.00%	42.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

ISR Note: For mailed-in thermostats, ISR is assumed at 59% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: DNV GL RI EnergyWise Single Family Evaluation, July 2016

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Programmable Thermostat	0.00	0.00	3.63	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Programmable Thermostat	0.47	0.01	0.04	0.58

NTG Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

TRC: $100.00 / unit

Incentive: $100.00 / unit

Showerhead

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** LF Showerhead

Program: Energy Wise Single Family

Measure Description

Installation of a low flow showerhead with a flow rate of 1.5 GPM or less.

Baseline Description

The baseline efficiency case is a showerhead with a flow of 2.5 gpm. For home audit applications, the baseline is the existing showerhead.

Savings Principle

The high efficiency is a low-flow showerhead with a flow of 1.5 gpm or less.

Savings Method

Deemed

Unit

Installed showerhead.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Showerhead	0	0	0.00	1.11	0.00	0.00	0.00

Gas DHW MMBtu Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Showerhead	15	0.98	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Showerhead	0.00%	0.00%	0.00%	0.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

Measure Life Note: Massachusetts Common Assumption

ISR Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

ISR Note: For mailed-in showerheads, ISR is assumed at 53% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: DNV GL RI EnergyWise Single Family Evaluation, July 2016

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Showerhead	1565.00	0.00	0	0.03

Water/Sewer Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

One-time $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Showerhead	0.27	0.01	0.04	0.78

NTG Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

TRC: $30.00 / unit

Incentive: $30.00 / unit

Triple Pane Windows

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, triple pane

Program: Energy Wise Single Family

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Triple Pane Windows	7.0	0.0100	0.60	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Gas Heat MMBtu Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Triple Pane Windows	14	1.00	1.00		1.00	1.00	1.00	0.37	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Triple Pane Windows	4.00%	4.00%	50.00%	43.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Triple Pane Windows	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Triple Pane Windows	0.04	0.00	0.04	0.96

NTG Source: MA 2022 TRM

Weatherization

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Whole Home | **Measure Type:** Weatherization | **Measure Sub Type:** EW SF

Program: Energy Wise Single Family

Measure Description

Installation of weatherization measures such as air sealing and insulation in gas heated homes. Electric savings are achieved from reduced run time of the HVAC system fan(s).

Baseline Description

The baseline efficiency case is the existing home shell.

Savings Principle

The high efficiency case can be a combination of increased insulation, air sealing, duct sealing, and other improvements to the home shell.

Savings Method

Deemed

Unit

Household with weatherization measures installed

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Weatherization	48.0	0.0370	9.60	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Gas Heat MMBtu Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Weatherization	25	1.00	1.00	1.00	1.00			0.34	0.21

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Weatherization	25.00%	30.00%	23.00%	22.00%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: DNV GL RI EnergyWise Single Family Evaluation, July 2016

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Weatherization	0.00	0.00	66.59	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Weatherization	0.14	0.01	0.04	0.91

NTG Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

TRC: $4,700.00 / participant

Incentive: $3,800.00 / participant

WiFi Thermostat

Sector: Residential | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: Energy Wise Single Family

Measure Description

Installation of a wifi thermostat which gives the ability to adjust heating or air-conditioning operating times according to a pre-set schedule.

Baseline Description

For the installation of a programmable thermostat, the baseline efficiency case is an HVAC system using natural gas to provide space heating without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system with a wi-fi programmable thermostat installed.

Savings Method

Deemed

Unit

Installation of WiFi programmable thermostat

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
WiFi Thermostat	27.0	0.0430	2.79	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Gas Heat MMBtu Source: MA Smart Thermostat Impact Study (RES 24) - Final Results

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
WiFi Thermostat	15	1.00	1.00	1.00	1.00			0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
WiFi Thermostat	7.00%	4.00%	47.00%	42.00%

Measure Life Source: Environmental Protection Agency (2010). Life Cycle Cost Estimate for Programmable Thermostats. Accessed on 10/12/2011.

ISR Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

ISR Note: For mailed-in thermostats, ISR is assumed at 59% based on MA VHEA Study (MA20R26-B-VHEA).

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: DNV GL RI EnergyWise Single Family Evaluation, July 2016

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
WiFi Thermostat	0.00	0.00	3.63	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
WiFi Thermostat	0.47	0.01	0.04	0.58

NTG Source: Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).

TRC: $300.00 / unit

Incentive: $200.00 / unit

Adaptive Reuse

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Adaptive Reuse

Program: Residential New Construction

Measure Description

To capture lost opportunities, encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards net-zero energy.

Baseline Description

The User Defined Reference Home was revised in 2012 as a result of a baseline study.

Savings Principle

The high efficiency case is represented by the specific energy characteristics of each "as-built" home completed through the program.

Savings Method

Calculated using site-specific inputs

Unit

Completed ESH heating, cooling, or DHW project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Adaptive Reuse	Calc	Calc	Calc	Calc	Calc	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Adaptive Reuse	15	1.00	1.00	1.00	1.00	1.00	1.00		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Adaptive Reuse	0.90%	4.10%	53.80%	41.20%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Adaptive Reuse	0.00	0.00	117.00	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Adaptive Reuse	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

CODES AND STANDARDS

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Codes and Standards | **Measure Sub Type:** Codes and Standards

Program: Residential New Construction

Measure Description

Energy efficiency code trainings and advocacy work to improve energy efficiency of buildings and equipment within Rhode Island.

Baseline Description

Un-influenced adoption curve of federal minimum codes and standards.

Savings Principle

Accelerated adoption of advancing energy codes and equipment standards.

Savings Method

Calculated based on attribution study

Unit

Adoption of advancing energy codes and equipment standards.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
CODES AND STANDARDS	Calc	0	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR - Rhode Island Code Compliance Enhancement Initiative Attribution and Savings Study

Gas Heat MMBtu Source: NMR - Rhode Island Code Compliance Enhancement Initiative Attribution and Savings Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
CODES AND STANDARDS	11	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
CODES AND STANDARDS	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
CODES AND STANDARDS	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
CODES AND STANDARDS	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $150k for res+C&I C&S

Incentive: $150k for res+C&I C&S

Cooling_Tier1

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Insulation | **Measure Sub Type:** Efficient Cooling

Program: Residential New Construction

Measure Description

To capture lost opportunities, encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards net-zero energy.

Baseline Description

The User Defined Reference Home was revised in 2012 as a result of a baseline study.

Savings Principle

The high efficiency case is represented by the specific energy characteristics of each "as-built" home completed through the program.

Savings Method

Calculated using site-specific inputs

Unit

Per energy efficient home

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Cooling_Tier1	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Cooling_Tier1	25	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Cooling_Tier1	0.90%	4.12%	53.82%	41.17%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Cooling_Tier1	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Cooling_Tier1	0.25	0.00	0.00	0.75

NTG Source: NMR Group, Inc (2021). Low Rise NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

Cooling_Tier2

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Insulation | **Measure Sub Type:** Efficient Cooling

Program: Residential New Construction

Measure Description

To capture lost opportunities, encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards net-zero energy.

Baseline Description

The User Defined Reference Home was revised in 2012 as a result of a baseline study.

Savings Principle

The high efficiency case is represented by the specific energy characteristics of each "as-built" home completed through the program.

Savings Method

Calculated using site-specific inputs

Unit

Per energy efficient home

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Cooling_Tier2	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Cooling_Tier2	25	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Cooling_Tier2	0.90%	4.12%	53.82%	41.17%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Cooling_Tier2	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Cooling_Tier2	0.25	0.00	0.00	0.75

NTG Source: NMR Group, Inc (2021). Low Rise NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

Cooling_Tier3

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Insulation | **Measure Sub Type:** Efficient Cooling

Program: Residential New Construction

Measure Description

To capture lost opportunities, encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards net-zero energy.

Baseline Description

The User Defined Reference Home was revised in 2012 as a result of a baseline study.

Savings Principle

The high efficiency case is represented by the specific energy characteristics of each "as-built" home completed through the program.

Savings Method

Calculated using site-specific inputs

Unit

Per energy efficient home

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Cooling_Tier3	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Cooling_Tier3	25	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Cooling_Tier3	0.90%	4.12%	53.82%	41.17%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Cooling_Tier3	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Cooling_Tier3	0.25	0.00	0.00	0.75

NTG Source: NMR Group, Inc (2021). Low Rise NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

CP

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Heating

Program: Residential New Construction

Measure Description

To capture lost opportunities, encourage the construction of energy-efficient homes, and drive the market to one in which new homes are moving towards net-zero energy.

Baseline Description

The User Defined Reference Home was revised in 2012 as a result of a baseline study.

Savings Principle

The high efficiency case is represented by the specific energy characteristics of each "as-built" home completed through the program.

Savings Method

Calculated using site-specific inputs

Unit

Per energy efficient home

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
CP	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
CP	25	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
CP	0.90%	4.12%	53.82%	41.17%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
CP	0.00	0.00	142.33	0

Annual $ Source: NMR Group, Inc (2021). Residential New Construction Quick Hit NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
CP	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

CP-DHW

Sector: Residential

Fuel: Gas

Program Type: Custom

Measure Category: Whole Home

Measure Type: Custom

Measure Sub Type: Flow Control Measures

Program: Residential New Construction

Measure Description

DHW measures including high-efficiency low-flow showerheads and faucet aerators save water and water heating energy.

Baseline Description

The User Defined Reference Home was revised in 2012 as a result of a baseline study.

Savings Principle

The high efficiency case is represented by the specific energy characteristics of each "as-built" home completed through the program.

Savings Method

Calculated using site-specific inputs

Unit

Per energy efficient home

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
CP-DHW	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
CP-DHW	15	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
CP-DHW	35.84%	30.76%	17.26%	16.14%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
CP-DHW	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
CP-DHW	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $1,074.00 / home

Incentive: $310.00 / home

Heating_Tier1

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: HVAC | **Measure Type:** Heating | **Measure Sub Type:** Efficient Heating

Program: Residential New Construction

Measure Description

This measure involves the installation of a high-efficiency natural gas heating system.

Baseline Description

The baseline efficiency case is a standard efficiency natural gas heating system.

Savings Principle

The high efficiency case is the installation of a high-efficiency natural gas heating system.

Savings Method

Deemed

Unit

Installed high-efficiency natural gas heating system.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heating_Tier1	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heating_Tier1	25	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heating_Tier1	37.81%	61.53%	0.17%	0.49%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heating_Tier1	0.00	0.00	117.00	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heating_Tier1	0.25	0.00	0.00	0.75

NTG Source: NMR Group, Inc (2021). Low Rise NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $1,630.00 / home

Incentive: $1,050.00 / home

Heating_Tier2

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: HVAC | **Measure Type:** Heating | **Measure Sub Type:** Efficient Heating

Program: Residential New Construction

Measure Description

This measure involves the installation of a high-efficiency natural gas heating system.

Baseline Description

The baseline efficiency case is a standard efficiency natural gas heating system.

Savings Principle

The high efficiency case is the installation of a high-efficiency natural gas heating system.

Savings Method

Deemed

Unit

Installed high-efficiency natural gas heating system.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heating_Tier2	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heating_Tier2	25	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heating_Tier2	37.81%	61.53%	0.17%	0.49%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heating_Tier2	0.00	0.00	117.00	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heating_Tier2	0.25	0.00	0.00	0.75

NTG Source: NMR Group, Inc (2021). Low Rise NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $4,860.00 / home

Incentive: $1,975.00 / home

Heating_Tier3

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: HVAC | **Measure Type:** Heating | **Measure Sub Type:** Efficient Heating

Program: Residential New Construction

Measure Description

This measure involves the installation of a high-efficiency natural gas heating system.

Baseline Description

The baseline efficiency case is a standard efficiency natural gas heating system.

Savings Principle

The high efficiency case is the installation of a high-efficiency natural gas heating system.

Savings Method

Deemed

Unit

Installed high-efficiency natural gas heating system.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heating_Tier3	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heating_Tier3	25	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heating_Tier3	37.81%	61.53%	0.17%	0.49%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heating_Tier3	0.00	0.00	117.00	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heating_Tier3	0.25	0.00	0.00	0.75

NTG Source: NMR Group, Inc (2021). Low Rise NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $7,688.00 / home

Incentive: $2,300.00 / home

Hot Water Heating_Tier1

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Flow Control Measures

Program: Residential New Construction

Measure Description

DHW measures including high-efficiency low-flow showerheads and faucet aerators save water and water heating energy.

Baseline Description

The baseline efficiency case is the existing domestic hot water equipment.

Savings Principle

The high efficiency case is the installation of high-efficiency domestic hot water equipment such as low-flow showerheads and faucet aerators.

Savings Method

Deemed

Unit

Installed DHW efficiency measure.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Hot Water Heating_Tier1	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Hot Water Heating_Tier1	15	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Hot Water Heating_Tier1	35.84%	30.76%	17.26%	16.14%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Hot Water Heating_Tier1	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Hot Water Heating_Tier1	0.25	0.00	0.00	0.75

NTG Source: NMR Group, Inc (2021). Low Rise NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $400.00 / home

Incentive: $50.00 / home

Hot water heating_Tier2

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Flow Control Measures

Program: Residential New Construction

Measure Description

DHW measures including high-efficiency low-flow showerheads and faucet aerators save water and water heating energy.

Baseline Description

The baseline efficiency case is the existing domestic hot water equipment.

Savings Principle

The high efficiency case is the installation of high-efficiency domestic hot water equipment such as low-flow showerheads and faucet aerators.

Savings Method

Deemed

Unit

Installed DHW efficiency measure.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Hot water heating_Tier2	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Hot water heating_Tier2	15	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Hot water heating_Tier2	35.84%	30.76%	17.26%	16.14%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Hot water heating_Tier2	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Hot water heating_Tier2	0.25	0.00	0.00	0.75

NTG Source: NMR Group, Inc (2021). Low Rise NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $400.00 / home

Incentive: $150.00 / home

Hot water heating_Tier3

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Flow Control Measures

Program: Residential New Construction

Measure Description

DHW measures including high-efficiency low-flow showerheads and faucet aerators save water and water heating energy.

Baseline Description

The baseline efficiency case is the existing domestic hot water equipment.

Savings Principle

The high efficiency case is the installation of high-efficiency domestic hot water equipment such as low-flow showerheads and faucet aerators.

Savings Method

Deemed

Unit

Installed DHW efficiency measure.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Hot water heating_Tier3	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Hot water heating_Tier3	15	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Hot water heating_Tier3	35.84%	30.76%	17.26%	16.14%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Hot water heating_Tier3	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Hot water heating_Tier3	0.25	0.00	0.00	0.75

NTG Source: NMR Group, Inc (2021). Low Rise NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $400.00 / home

Incentive: $150.00 / home

Renovation Rehab CP

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Heating

Program: Residential New Construction

Measure Description

The heating savings resulting from Renovation Rehab projects that include the installation of roof, wall, and basement insulation.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab CP	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab CP	25	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab CP	0.90%	4.12%	53.82%	41.17%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab CP	0.00	0.00	142.33	0

Annual $ Source: NMR Group, Inc (2021). Residential New Construction Quick Hit NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab CP	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: ESH Bundled costs

Incentive: ESH Bundled costs

Renovation Rehab CP Heating

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Cooling

Program: Residential New Construction

Measure Description

The cooling savings resulting from Renovation Rehab projects that include the installation of roof, wall, and basement insulation.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab CP Heating	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab CP Heating	25	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab CP Heating	37.81%	61.53%	0.17%	0.49%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab CP Heating	0.00	0.00	117.00	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab CP Heating	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $787.00 / home

Incentive: $310.00 / home

Renovation Rehab CP Heating_Elec

Sector: Residential **Fuel:** Gas **Program Type:** Custom

Measure Category: Whole Home **Measure Type:** Custom **Measure Sub Type:** Cooling

Program: Residential New Construction

Measure Description

The cooling savings resulting from Renovation Rehab projects that include the installation of roof, wall, and basement insulation.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab CP Heating_Elec	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab CP Heating_Elec	25	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab CP Heating_Elec	37.81%	61.53%	0.17%	0.49%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab CP Heating_Elec	0.00	0.00	117.00	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab CP Heating_Elec	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $787.00 / home

Incentive: $310.00 / home

Renovation Rehab CP Heating_Gas

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Cooling

Program: Residential New Construction

Measure Description

The cooling savings resulting from Renovation Rehab projects that include the installation of roof, wall, and basement insulation.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab CP Heating_Gas	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab CP Heating_Gas	25	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab CP Heating_Gas	37.81%	61.53%	0.17%	0.49%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab CP Heating_Gas	0.00	0.00	117.00	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab CP Heating_Gas	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $787.00 / home

Incentive: $310.00 / home

Renovation Rehab CP-DHW

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** DHW

Program: Residential New Construction

Measure Description

The DHW savings resulting from Renovation Rehab projects that include more efficient water heating systems.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab CP-DHW	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab CP-DHW	15	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab CP-DHW	35.84%	30.76%	17.26%	16.14%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab CP-DHW	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab CP-DHW	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $100.00 / home

Incentive: $75.00 / home

Renovation Rehab Domestic Hot Water_Tier1

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** DHW

Program: Residential New Construction

Measure Description

The DHW savings resulting from Renovation Rehab projects that include more efficient water heating systems.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Domestic Hot Water_Tier1	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Domestic Hot Water_Tier1	25	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Domestic Hot Water_Tier1	35.84%	30.76%	17.26%	16.14%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Domestic Hot Water_Tier1	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Domestic Hot Water_Tier1	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $100.00 / home

Incentive: $75.00 / home

Renovation Rehab Domestic Hot Water_Tier1 Gas

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** DHW

Program: Residential New Construction

Measure Description

The DHW savings resulting from Renovation Rehab projects that include more efficient water heating systems.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Domestic Hot Water_Tier1 Gas	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kWh Note: Supplied by vendor

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Note: Supplied by vendor

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Domestic Hot Water_Tier1 Gas	15	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Domestic Hot Water_Tier1 Gas	35.84%	30.76%	17.26%	16.14%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Domestic Hot Water_Tier1 Gas	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Domestic Hot Water_Tier1 Gas	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $400.00 / home

Incentive: $50.00 / home

Renovation Rehab Domestic Hot Water_Tier2 Gas

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** DHW

Program: Residential New Construction

Measure Description

The DHW savings resulting from Renovation Rehab projects that include more efficient water heating systems.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Domestic Hot Water_Tier2 Gas	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kWh Note: Supplied by vendor

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Note: Supplied by vendor

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Domestic Hot Water_Tier2 Gas	15	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Domestic Hot Water_Tier2 Gas	35.84%	30.76%	17.26%	16.14%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Domestic Hot Water_Tier2 Gas	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Domestic Hot Water_Tier2 Gas	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $400.00 / home

Incentive: $150.00 / home

Renovation Rehab Domestic Hot Water_Tier3 Gas

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** DHW

Program: Residential New Construction

Measure Description

The DHW savings resulting from Renovation Rehab projects that include more efficient water heating systems.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Domestic Hot Water_Tier3 Gas	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kWh Note: Supplied by vendor

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Note: Supplied by vendor

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Domestic Hot Water_Tier3 Gas	15	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Domestic Hot Water_Tier3 Gas	35.84%	30.76%	17.26%	16.14%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Domestic Hot Water_Tier3 Gas	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Domestic Hot Water_Tier3 Gas	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $400.00 / home

Incentive: $150.00 / home

Renovation Rehab Heating_Tier1

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Heating

Program: Residential New Construction

Measure Description

The heating savings resulting from Renovation Rehab projects that include the installation of roof, wall, and basement insulation.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Heating_Tier1	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Note: Calculated, per 100ft2.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Heating_Tier1	25	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Heating_Tier1	37.81%	61.53%	0.17%	0.49%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Heating_Tier1	0.00	0.00	142.33	0

Annual $ Source: NMR Group, Inc (2021). Residential New Construction Quick Hit NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Heating_Tier1	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $1,838.00 / home

Incentive: $1,050.00 / home

Renovation Rehab Heating_Tier1 Cooling

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Heating

Program: Residential New Construction

Measure Description

The heating savings resulting from Renovation Rehab projects that include the installation of roof, wall, and basement insulation.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Heating_Tier1 Cooling	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Heating_Tier1 Cooling	25	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Heating_Tier1 Cooling	2.50%	4.80%	42.58%	50.13%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Heating_Tier1 Cooling	0.00	0.00	142.33	0

Annual $ Source: NMR Group, Inc (2021). Residential New Construction Quick Hit NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Heating_Tier1 Cooling	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

Renovation Rehab Heating_Tier2

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Heating

Program: Residential New Construction

Measure Description

The heating savings resulting from Renovation Rehab projects that include the installation of roof, wall, and basement insulation.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Heating_Tier2	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Note: Calculated, per 100ft2.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Heating_Tier2	25	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Heating_Tier2	37.81%	61.53%	0.17%	0.49%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Heating_Tier2	0.00	0.00	142.33	0

Annual $ Source: NMR Group, Inc (2021). Residential New Construction Quick Hit NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Heating_Tier2	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $2,767.00 / home

Incentive: $1,450.00 / home

Renovation Rehab Heating_Tier2 Cooling Gas

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Heating

Program: Residential New Construction

Measure Description

The heating savings resulting from Renovation Rehab projects that include the installation of roof, wall, and basement insulation.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Heating_Tier2 Cooling Gas	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Heating_Tier2 Cooling Gas	25	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Heating_Tier2 Cooling Gas	2.50%	4.80%	42.58%	50.13%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Heating_Tier2 Cooling Gas	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Heating_Tier2 Cooling Gas	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

Renovation Rehab Heating_Tier3

Sector: Residential | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Whole Home | **Measure Type:** Custom | **Measure Sub Type:** Heating

Program: Residential New Construction

Measure Description

The heating savings resulting from Renovation Rehab projects that include the installation of roof, wall, and basement insulation.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Heating_Tier3	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Note: Calculated, per 100ft2.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Heating_Tier3	25	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Heating_Tier3	37.81%	61.53%	0.17%	0.49%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Heating_Tier3	0.00	0.00	142.33	0

Annual $ Source: NMR Group, Inc (2021). Residential New Construction Quick Hit NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Heating_Tier3	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

TRC: $9,330.00 / home

Incentive: $2,535.00 / home

Renovation Rehab Heating_Tier3 Cooling Gas

Sector: Residential **Fuel:** Gas **Program Type:** Custom

Measure Category: Whole Home **Measure Type:** Custom **Measure Sub Type:** Heating

Program: Residential New Construction

Measure Description

The heating savings resulting from Renovation Rehab projects that include the installation of roof, wall, and basement insulation.

Baseline Description

The baseline case is the current version of the RI energy code and/or UDRH performance.

Savings Principle

The efficient case is the post-retrofit performance of a house participating the program.

Savings Method

Calculated using site-specific inputs

Unit

Complete Renovation Rehab project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Renovation Rehab Heating_Tier3 Cooling Gas	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Electric kW Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Gas Heat MMBtu Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Renovation Rehab Heating_Tier3 Cooling Gas	25	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Renovation Rehab Heating_Tier3 Cooling Gas	2.50%	4.80%	42.58%	50.13%

Measure Life Source: NMR Group, KEMA, The Cadmus Group, Dorothy Conant (2012). Rhode Island 2011 Baseline Study of Single-Family Residential New Construction. Prepared for National Grid.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Renovation Rehab Heating_Tier3 Cooling Gas	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Renovation Rehab Heating_Tier3 Cooling Gas	0.22	0.02	0.12	0.92

NTG Source: NMR Group, Inc (2021). R&A NTG study

NTG Note: Net-to-gross negotiated with C-Team based on MA results.

Income Eligible

Appliance Removal

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** Recycling | **Measure Sub Type:** Refrigerator Recycling

Program: B03a Single Family - Appliance Management

Measure Description

This measure covers the removal of an existing inefficient refrigerator.

Baseline Description

The baseline efficiency case is the old, inefficient working refrigerator or freezer.

Savings Principle

The high efficiency case assumes no replacement of secondary unit.

Savings Method

Calculated using deemed inputs

Unit

Installed high-efficiency refrigerator

Savings Equation

Gross kWh = Qty × (kWh_base - kWh_ee)

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

kWh_base = Deemed average demand per baseline unit.

kWh_ee = Deemed average demand per high-efficiency unit.

DeltakW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Appliance Removal	1,036.0	0.1900	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Appliance Removal	5	1.00	1.00		1.00	1.00	1.00	0.79	0.65

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Appliance Removal	29.00%	32.00%	18.00%	21.00%

Measure Life Note: National Grid assumption based on regional PA working groups.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Appliance Removal	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Appliance Removal	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

Basic Educational Measures

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Whole Home | **Measure Type:** Audit | **Measure Sub Type:** Educational Kit

Program: B03a Single Family - Appliance Management

Measure Description

Installation of basic educational measures during an audit to help customers become more aware of energy efficiency.

Baseline Description

The baseline efficiency case assumes no measures installed.

Savings Principle

The high efficiency case includes basic educational measures such as CFLs, low flow showerheads, pool

and air conditioner timers, torchieres, and programmable thermostats.

Savings Method

Deemed

Unit

Completed audit.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Basic Educational Measures	21.0	0.0040	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Basic Educational Measures	5	1.00	1.00		1.00	1.00	1.00	0.58	0.86

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Basic Educational Measures	32.00%	35.00%	15.00%	18.00%

Measure Life Note: National Grid assumption based on regional PA working groups.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Basic Educational Measures	0.00	0.00	10.37	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Basic Educational Measures	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

Dehumidifier Rebate

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** Dehumidifiers | **Measure Sub Type:** Dehumidifier

Program: B03a Single Family - Appliance Management

Measure Description

The Installation of high efficiency dehumidifiers and the turn-in of existing inefficient dehumidifiers.

Baseline Description

The baseline efficiency case is the existing dehumidifier. It is assumed that low-income customers would otherwise replace their dehumidifiers with a used inefficient unit.

Savings Principle

The high efficiency case is an ENERGY STAR® replacement unit with an efficiency of 1.47 L/kWh. The high efficiency case is an ENERGY STAR® replacement unit with an efficiency of 1.47 L/kWh.

Savings Method

Calculated using deemed inputs

Unit

Per dehumidifier

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dehumidifier Rebate	489.4	0.1100	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dehumidifier Rebate	17	1.00	1.00		1.00	1.00	1.00	0.82	0.17

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dehumidifier Rebate	22.00%	23.00%	25.00%	30.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dehumidifier Rebate	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dehumidifier Rebate	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $275.00 / measure

Incentive: $275.00 / measure

Domestic Hot Water Measure, Electric

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Flow Control Measures

Program: B03a Single Family - Appliance Management

Measure Description

Domestic hot water measures include high-efficiency low-flow showerheads and faucet aerators that can save water and water heating energy.

Baseline Description

The baseline efficiency case is the existing domestic hot water equipment.

Savings Principle

The high efficiency case is the installation of high-efficiency domestic hot water equipment such as low-flow showerheads and faucet aerators.

Savings Method

Deemed

Unit

Installed DHW efficiency measure.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Gross MMBtu_Oil = Qty × deltaMMBtu_Oil

Gross MMBtu_Propane = Qty× deltaMMBtu_Propane

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

deltaMMBtu_Oil = Average annual oil reduction per unit

deltaMMBtu_Propane = Average annual propane reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Domestic Hot Water Measure, Electric	160.0	0.0400	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Domestic Hot Water Measure, Electric	7	1.00	1.00		1.00	1.00	1.00	0.31	0.81

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Domestic Hot Water Measure, Electric	42.00%	31.00%	15.00%	12.00%

Measure Life Note: National Grid assumption based on regional PA working groups.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Domestic Hot Water Measure, Electric	4028.00	0.00	0	1.72

Water/Sewer Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

One-time $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Domestic Hot Water Measure, Electric	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $20.00 / measure

Incentive: $20.00 / measure

Domestic Hot Water Measure, Gas

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Flow Control Measures

Program: B03a Single Family - Appliance Management

Measure Description

Domestic hot water measures include high-efficiency low-flow showerheads and faucet aerators that can save water and water heating energy.

Baseline Description

The baseline efficiency case is the existing domestic hot water equipment.

Savings Principle

The high efficiency case is the installation of high-efficiency domestic hot water equipment such as low-flow showerheads and faucet aerators.

Savings Method

Deemed

Unit

Installed DHW efficiency measure.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Gross MMBtu_Oil = Qty × deltaMMBtu_Oil

Gross MMBtu_Propane = Qty× deltaMMBtu_Propane

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

deltaMMBtu_Oil = Average annual oil reduction per unit

deltaMMBtu_Propane = Average annual propane reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Domestic Hot Water Measure, Gas	0.0	0.0000	0.83	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Gas Heat MMBtu Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Domestic Hot Water Measure, Gas	7	1.00	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Domestic Hot Water Measure, Gas	0.00%	0.00%	0.00%	0.00%

Measure Life Note: National Grid assumption based on regional PA working groups.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Domestic Hot Water Measure, Gas	4028.00	0.00	0	1.72

Water/Sewer Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

One-time $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Domestic Hot Water Measure, Gas	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $20.00 / measure

Incentive: $20.00 / measure

Domestic Hot Water Measure, Oil

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Flow Control Measures

Program: B03a Single Family - Appliance Management

Measure Description

Domestic hot water measures include high-efficiency low-flow showerheads and faucet aerators that can save water and water heating energy.

Baseline Description

The baseline efficiency case is the existing domestic hot water equipment.

Savings Principle

The high efficiency case is the installation of high-efficiency domestic hot water equipment such as low-flow showerheads and faucet aerators.

Savings Method

Deemed

Unit

Installed DHW efficiency measure.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Gross MMBtu_Oil = Qty × deltaMMBtu_Oil

Gross MMBtu_Propane = Qty× deltaMMBtu_Propane

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

deltaMMBtu_Oil = Average annual oil reduction per unit

deltaMMBtu_Propane = Average annual propane reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Domestic Hot Water Measure, Oil	0.0	0.0000	0.00	0.00	0.00	0.90	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Oil MMBtu Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Domestic Hot Water Measure, Oil	7	1.00	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Domestic Hot Water Measure, Oil	0.00%	0.00%	0.00%	0.00%

Measure Life Note: National Grid assumption based on regional PA working groups.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Domestic Hot Water Measure, Oil	4028.00	0.00	0	1.72

Water/Sewer Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

One-time $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Domestic Hot Water Measure, Oil	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $20.00 / measure

Incentive: $20.00 / measure

Early Retirement Clothes Washer Elec DHW & Elec Dryer

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** ER CW & Dryer | **Measure Sub Type:** ER ele DHW washer & ele dryer

Program: B03a Single Family - Appliance Management

Measure Description

The replacement and recycling of a working top-loading clothes washer with an agitator with an Energy Star rated washing machine.

Baseline Description

The baseline efficiency case is the existing clothes washer & dryer.

Savings Principle

The high efficiency case is a new high efficiency washer & dryer.

Savings Method

Calculated using deemed inputs

Unit

Installed high-efficiency washer & dryer.

Savings Equation

ΔkWh = [(Capacity x 1/IMEFbase x Ncycles) * (%CWkwhbase + %DHWkwhbase + %Dryerkwhbase)] - [(Capacity x 1/IMEFeff x Ncycles) x (%CWkwheff + %DHWkwheff + %Dryerkwheff)]

ΔMMBTUs = [(Capacity x 1/MEFbase x Ncycles) x ((%DHWffbase x reff) + %Dryerffbase] - [(Capacity x 1/MEFeff x Ncycles) x (%DHWffeff x reff) + %Dryergaseff]xMMBTUconvert

where:

Capacity = washer volume in ft3. Existing top loading washer is 3.09 ft3, new standard efficiency top loading washer is 3.38 ft3, ENERGY STAR front loading is 3.90 ft

IMEF = Integrated Modified Energy Factor and is measured in ft3 /kWh/cycle

Ncycles = 283 loads per year

%CWkwh = % of total kWh energy consumption for clothes washer operation (different for baseline and efficient unit).

%DHWkwh = % of total kWh energy consumption used for water heating (different for baseline and efficient unit). If water is heated by gas or propane this is 0%

%DHWff = % of total kWh energy consumption for dryer operation (different for baseline and efficient unit). If the dryer is gas this is 0%

%Dryerkwh = % of total fossil fuel energy consumption used for water heating (different for baseline and efficient unit). If water is heated by electric this is 0%.

%Dryerff = % of total fossil fuel energy consumption for dryer operation (different for baseline and efficient unit). If the dryer is electric this is 0%.

r_eff = recovery energy factor used to account for the difference in recovery efficiencies of electric and gas/oil/propane hot water heaters. Electric water heaters are 100% efficient while other water heaters are 75% efficient. The ratio is 1.33 (100%/75%)

MMBTU_convert = Conversion factor from kWh to MMBTU is 0.003412

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Early Retirement Clothes Washer Elec DHW & Elec Dryer	588.0	0.1600	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Early Retirement Clothes Washer Elec DHW & Elec Dryer	12	1.00	1.00		1.00	1.00	1.00	0.49	0.52

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Early Retirement Clothes Washer Elec DHW & Elec Dryer	36.44%	29.90%	18.29%	15.36%

Measure Life Source: Washer & Dryer savings references

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Early Retirement Clothes Washer Elec DHW & Elec Dryer	4777.00	0.00	0	0

Water/Sewer Source: Washer & Dryer savings references

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Early Retirement Clothes Washer Elec DHW & Elec Dryer	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $770.00 / measure

Incentive: $770.00 / measure

Early Retirement Clothes Washer Elec DHW & Gas Dryer

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** ER CW & Dryer | **Measure Sub Type:** ER ele DHW washer & gas dryer

Program: B03a Single Family - Appliance Management

Measure Description

The replacement and recycling of a working top-loading clothes washer with an agitator with an Energy Star rated washing machine.

Baseline Description

The baseline efficiency case is the existing clothes washer & dryer.

Savings Principle

The high efficiency case is a new high efficiency washer & dryer.

Savings Method

Calculated using deemed inputs

Unit

Installed high-efficiency washer & dryer.

Savings Equation

ΔkWh = [(Capacity x 1/IMEFbase x Ncycles) * (%CWkwhbase + %DHWkwhbase + %Dryerkwhbase)] - [(Capacity x 1/IMEFeff x Ncycles) x (%CWkwheff + %DHWkwheff + %Dryerkwheff)]

ΔMMBTUs = [(Capacity x 1/MEFbase x Ncycles) x ((%DHWffbase x reff) + %Dryerffbase] - [(Capacity x 1/MEFeff x Ncycles) x (%DHWffeff x reff) + %Dryergaseff]xMMBTUconvert

where:

Capacity = washer volume in ft3. Existing top loading washer is 3.09 ft3, new standard efficiency top loading washer is 3.38 ft3, ENERGY STAR front loading is 3.90 ft

IMEF = Integrated Modified Energy Factor and is measured in ft3 /kWh/cycle

Ncycles = 283 loads per year

%CWkwh = % of total kWh energy consumption for clothes washer operation (different for baseline and efficient unit).

%DHWkwh = % of total kWh energy consumption used for water heating (different for baseline and efficient unit). If water is heated by gas or propane this is 0%

%DHWff = % of total kWh energy consumption for dryer operation (different for baseline and efficient unit). If the dryer is gas this is 0%

%Dryerkwh = % of total fossil fuel energy consumption used for water heating (different for baseline and efficient unit). If water is heated by electric this is 0%.

%Dryerff = % of total fossil fuel energy consumption for dryer operation (different for baseline and efficient unit). If the dryer is electric this is 0%.

r_eff = recovery energy factor used to account for the difference in recovery efficiencies of electric and gas/oil/propane hot water heaters. Electric water heaters are 100% efficient while other water heaters are 75% efficient. The ratio is 1.33 (100%/75%)

MMBTU_convert = Conversion factor from kWh to MMBTU is 0.003412

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Early Retirement Clothes Washer Elec DHW & Gas Dryer	307.0	0.0800	0.00	0.96	0.00	0.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Gas DHW MMBtu Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Early Retirement Clothes Washer Elec DHW & Gas Dryer	12	1.00	1.00		1.00	1.00	1.00	0.49	0.52

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Early Retirement Clothes Washer Elec DHW & Gas Dryer	36.44%	29.90%	18.29%	15.36%

Measure Life Source: Washer & Dryer savings references

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Early Retirement Clothes Washer Elec DHW & Gas Dryer	4777.00	0.00	0	0

Water/Sewer Source: Washer & Dryer savings references

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Early Retirement Clothes Washer Elec DHW & Gas Dryer	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $770.00 / measure

Incentive: $770.00 / measure

Early Retirement Clothes Washer Gas DHW & Elec Dryer

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** ER CW & Dryer | **Measure Sub Type:** ER gas DHW washer & ele dryer

Program: B03a Single Family - Appliance Management

Measure Description

The replacement and recycling of a working top-loading clothes washer with an agitator with an Energy Star rated washing machine.

Baseline Description

The baseline efficiency case is the existing clothes washer & dryer.

Savings Principle

The high efficiency case is a new high efficiency washer & dryer.

Savings Method

Calculated using deemed inputs

Unit

Installed high-efficiency washer & dryer.

Savings Equation

ΔkWh = [(Capacity x 1/IMEFbase x Ncycles) * (%CWkwhbase + %DHWkwhbase + %Dryerkwhbase)] - [(Capacity x 1/IMEFeff x Ncycles) x (%CWkwheff + %DHWkwheff + %Dryerkwheff)]

ΔMMBTUs = [(Capacity x 1/MEFbase x Ncycles) x ((%DHWffbase x reff) + %Dryerffbase] - [(Capacity x 1/MEFeff x Ncycles) x (%DHWffeff x reff) + %Dryergaseff]xMMBTUconvert

where:

Capacity = washer volume in ft3. Existing top loading washer is 3.09 ft3, new standard efficiency top loading washer is 3.38 ft3, ENERGY STAR front loading is 3.90 ft

IMEF = Integrated Modified Energy Factor and is measured in ft3 /kWh/cycle

Ncycles = 283 loads per year

%CWkwh = % of total kWh energy consumption for clothes washer operation (different for baseline and efficient unit).

%DHWkwh = % of total kWh energy consumption used for water heating (different for baseline and efficient unit). If water is heated by gas or propane this is 0%

%DHWff = % of total kWh energy consumption for dryer operation (different for baseline and efficient unit). If the dryer is gas this is 0%

%Dryerkwh = % of total fossil fuel energy consumption used for water heating (different for baseline and efficient unit). If water is heated by electric this is 0%.

%Dryerff = % of total fossil fuel energy consumption for dryer operation (different for baseline and efficient unit). If the dryer is electric this is 0%.

r_eff = recovery energy factor used to account for the difference in recovery efficiencies of electric and gas/oil/propane hot water heaters. Electric water heaters are 100% efficient while other water heaters are 75% efficient. The ratio is 1.33 (100%/75%)

MMBTU_convert = Conversion factor from kWh to MMBTU is 0.003412

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Early Retirement Clothes Washer Gas DHW & Elec Dryer	327.0	0.0900	0.00	1.28	0.00	0.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Gas DHW MMBtu Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Early Retirement Clothes Washer Gas DHW & Elec Dryer	12	1.00	1.00		1.00	1.00	1.00	0.49	0.52

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Early Retirement Clothes Washer Gas DHW & Elec Dryer	36.44%	29.90%	18.29%	15.36%

Measure Life Source: Washer & Dryer savings references

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Early Retirement Clothes Washer Gas DHW & Elec Dryer	4777.00	0.00	0	0

Water/Sewer Source: Washer & Dryer savings references

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Early Retirement Clothes Washer Gas DHW & Elec Dryer	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $770.00 / measure

Incentive: $770.00 / measure

Early Retirement Clothes Washer Gas DHW & Gas Dryer

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** ER CW & Dryer | **Measure Sub Type:** ER gas DHW washer & gas dryer

Program: B03a Single Family - Appliance Management

Measure Description

The replacement and recycling of a working top-loading clothes washer with an agitator with an Energy Star rated washing machine.

Baseline Description

The baseline efficiency case is the existing clothes washer & dryer.

Savings Principle

The high efficiency case is a new high efficiency washer & dryer.

Savings Method

Calculated using deemed inputs

Unit

Installed high-efficiency washer & dryer.

Savings Equation

ΔkWh = [(Capacity x 1/IMEFbase x Ncycles) * (%CWkwhbase + %DHWkwhbase + %Dryerkwhbase)] - [(Capacity x 1/IMEFeff x Ncycles) x (%CWkwheff + %DHWkwheff + %Dryerkwheff)]

ΔMMBTUs = [(Capacity x 1/MEFbase x Ncycles) x ((%DHWffbase x reff) + %Dryerffbase] - [(Capacity x 1/MEFeff x Ncycles) x (%DHWffeff x reff) + %Dryergaseff]xMMBTUconvert

where:

Capacity = washer volume in ft3. Existing top loading washer is 3.09 ft3, new standard efficiency top loading washer is 3.38 ft3, ENERGY STAR front loading is 3.90 ft

IMEF = Integrated Modified Energy Factor and is measured in ft3 /kWh/cycle

Ncycles = 283 loads per year

%CWkwh = % of total kWh energy consumption for clothes washer operation (different for baseline and efficient unit).

%DHWkwh = % of total kWh energy consumption used for water heating (different for baseline and efficient unit). If water is heated by gas or propane this is 0%

%DHWff = % of total kWh energy consumption for dryer operation (different for baseline and efficient unit). If the dryer is gas this is 0%

%Dryerkwh = % of total fossil fuel energy consumption used for water heating (different for baseline and efficient unit). If water is heated by electric this is 0%.

%Dryerff = % of total fossil fuel energy consumption for dryer operation (different for baseline and efficient unit). If the dryer is electric this is 0%.

r_eff = recovery energy factor used to account for the difference in recovery efficiencies of electric and gas/oil/propane hot water heaters. Electric water heaters are 100% efficient while other water heaters are 75% efficient. The ratio is 1.33 (100%/75%)

MMBTU_convert = Conversion factor from kWh to MMBTU is 0.003412

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Early Retirement Clothes Washer Gas DHW & Gas Dryer	46.0	0.0100	0.00	2.24	0.00	0.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Gas DHW MMBtu Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Early Retirement Clothes Washer Gas DHW & Gas Dryer	12	1.00	1.00		1.00	1.00	1.00	0.49	0.52

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Early Retirement Clothes Washer Gas DHW & Gas Dryer	36.44%	29.90%	18.29%	15.36%

Measure Life Source: Washer & Dryer savings references

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Early Retirement Clothes Washer Gas DHW & Gas Dryer	4777.00	0.00	0	0

Water/Sewer Source: Washer & Dryer savings references

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Early Retirement Clothes Washer Gas DHW & Gas Dryer	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $770.00 / measure

Incentive: $770.00 / measure

Early Retirement Clothes Washer Oil DHW & Elec Dryer

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** ER CW & Dryer | **Measure Sub Type:** ER oil DHW washer & ele dryer

Program: B03a Single Family - Appliance Management

Measure Description

The replacement and recycling of a working top-loading clothes washer with an agitator with an Energy Star rated washing machine.

Baseline Description

The baseline efficiency case is the existing clothes washer & dryer.

Savings Principle

The high efficiency case is a new high efficiency washer & dryer.

Savings Method

Calculated using deemed inputs

Unit

Installed high-efficiency washer & dryer.

Savings Equation

ΔkWh = [(Capacity x 1/IMEFbase x Ncycles) * (%CWkwhbase + %DHWkwhbase + %Dryerkwhbase)] - [(Capacity x 1/IMEFeff x Ncycles) x (%CWkwheff + %DHWkwheff + %Dryerkwheff)]

ΔMMBTUs = [(Capacity x 1/MEFbase x Ncycles) x ((%DHWffbase x reff) + %Dryerffbase] - [(Capacity x 1/MEFeff x Ncycles) x (%DHWffeff x reff) + %Dryergaseff]xMMBTUconvert

where:

Capacity = washer volume in ft3. Existing top loading washer is 3.09 ft3, new standard efficiency top loading washer is 3.38 ft3, ENERGY STAR front loading is 3.90 ft

IMEF = Integrated Modified Energy Factor and is measured in ft3 /kWh/cycle

Ncycles = 283 loads per year

%CWkwh = % of total kWh energy consumption for clothes washer operation (different for baseline and efficient unit).

%DHWkwh = % of total kWh energy consumption used for water heating (different for baseline and efficient unit). If water is heated by gas or propane this is 0%

%DHWff = % of total kWh energy consumption for dryer operation (different for baseline and efficient unit). If the dryer is gas this is 0%

%Dryerkwh = % of total fossil fuel energy consumption used for water heating (different for baseline and efficient unit). If water is heated by electric this is 0%.

%Dryerff = % of total fossil fuel energy consumption for dryer operation (different for baseline and efficient unit). If the dryer is electric this is 0%.

r_eff = recovery energy factor used to account for the difference in recovery efficiencies of electric and gas/oil/propane hot water heaters. Electric water heaters are 100% efficient while other water heaters are 75% efficient. The ratio is 1.33 (100%/75%)

MMBTU_convert = Conversion factor from kWh to MMBTU is 0.003412

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Early Retirement Clothes Washer Oil DHW & Elec Dryer	327.0	0.0900	0.00	0.00	0.00	1.28	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Oil MMBtu Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Early Retirement Clothes Washer Oil DHW & Elec Dryer	12	1.00	1.00		1.00	1.00	1.00	0.49	0.52

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Early Retirement Clothes Washer Oil DHW & Elec Dryer	36.44%	29.90%	18.29%	15.36%

Measure Life Source: Washer & Dryer savings references

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Early Retirement Clothes Washer Oil DHW & Elec Dryer	4777.00	0.00	0	0

Water/Sewer Source: Washer & Dryer savings references

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Early Retirement Clothes Washer Oil DHW & Elec Dryer	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $770.00 / measure

Incentive: $770.00 / measure

Early Retirement Clothes Washer Propane DHW & Elec Dryer

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** ER CW & Dryer | **Measure Sub Type:** ER propane DHW washer & ele dryer

Program: B03a Single Family - Appliance Management

Measure Description

The replacement and recycling of a working top-loading clothes washer with an agitator with an Energy Star rated washing machine.

Baseline Description

The baseline efficiency case is the existing clothes washer & dryer.

Savings Principle

The high efficiency case is a new high efficiency washer & dryer.

Savings Method

Calculated using deemed inputs

Unit

Installed high-efficiency washer & dryer.

Savings Equation

ΔkWh = [(Capacity x 1/IMEFbase x Ncycles) * (%CWkwhbase + %DHWkwhbase + %Dryerkwhbase)] - [(Capacity x 1/IMEFeff x Ncycles) x (%CWkwheff + %DHWkwheff + %Dryerkwheff)]

ΔMMBTUs = [(Capacity x 1/MEFbase x Ncycles) x ((%DHWffbase x reff) + %Dryerffbase] - [(Capacity x 1/MEFeff x Ncycles) x (%DHWffeff x reff) + %Dryergaseff]xMMBTUconvert

where:

Capacity = washer volume in ft3. Existing top loading washer is 3.09 ft3, new standard efficiency top loading washer is 3.38 ft3, ENERGY STAR front loading is 3.90 ft

IMEF = Integrated Modified Energy Factor and is measured in ft3 /kWh/cycle

Ncycles = 283 loads per year

%CWkwh = % of total kWh energy consumption for clothes washer operation (different for baseline and efficient unit).

%DHWkwh = % of total kWh energy consumption used for water heating (different for baseline and efficient unit). If water is heated by gas or propane this is 0%

%DHWff = % of total kWh energy consumption for dryer operation (different for baseline and efficient unit). If the dryer is gas this is 0%

%Dryerkwh = % of total fossil fuel energy consumption used for water heating (different for baseline and efficient unit). If water is heated by electric this is 0%.

%Dryerff = % of total fossil fuel energy consumption for dryer operation (different for baseline and efficient unit). If the dryer is electric this is 0%.

r_eff = recovery energy factor used to account for the difference in recovery efficiencies of electric and gas/oil/propane hot water heaters. Electric water heaters are 100% efficient while other water heaters are 75% efficient. The ratio is 1.33 (100%/75%)

MMBTU_convert = Conversion factor from kWh to MMBTU is 0.003412

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Early Retirement Clothes Washer Propane DHW & Elec Dryer	327.0	0.0900	0.00	0.00	0.00	0.00	1.28

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Propane MMBtu Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Early Retirement Clothes Washer Propane DHW & Elec Dryer	12	1.00	1.00		1.00	1.00	1.00	0.49	0.52

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Early Retirement Clothes Washer Propane DHW & Elec Dryer	36.44%	29.90%	18.29%	15.36%

Measure Life Source: Washer & Dryer savings references

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Early Retirement Clothes Washer Propane DHW & Elec Dryer	4777.00	0.00	0	0

Water/Sewer Source: Washer & Dryer savings references

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Early Retirement Clothes Washer Propane DHW & Elec Dryer	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $770.00 / measure

Incentive: $770.00 / measure

Heating System Replacement, Oil

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Heating | **Measure Sub Type:** Efficient Heating

Program: B03a Single Family - Appliance Management

Measure Description

Replacement of existing oil heating system with a new high efficiency system. Electric savings can be attributed to reduced fan run time and reduced usage of electric space heaters.

Baseline Description

The baseline efficiency case is the existing inefficient heating equipment.

Savings Principle

The high efficiency case is the new efficient heating equipment.

Savings Method

Deemed

Unit

Installed high-efficiency heating system.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Gross MMBtu_Oil = Qty × deltaMMBtu_Oil

Gross MMBtu_Propane = Qty× deltaMMBtu_Propane

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

deltaMMBtu_Oil = Average annual oil reduction per unit

deltaMMBtu_Propane = Average annual propane reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heating System Replacement, Oil	10.0	0.0100	0.00	0.00	0.00	8.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Oil MMBtu Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heating System Replacement, Oil	18	1.00	1.00		1.00	1.00	1.00	0.34	0.21

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heating System Replacement, Oil	26.00%	31.00%	23.00%	21.00%

Measure Life Source: Environmental Protection Agency (2009). Life Cycle Cost Estimate for an ENERGY STAR Qualified Gas Residential Furnace.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heating System Replacement, Oil	0.00	0.00	310.82	0

Annual $ Source: Massachusetts Special and Cross-Cutting Research Area: Low-Income Single-Family Health- and Safety-Related Non-Energy Impacts (NEIs) Study, August 5, 2016. Prepared by: Three3, Inc. and NMR Group

NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heating System Replacement, Oil	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $5,500.00 / measure

Incentive: $5,500.00 / measure

Heat Pumps - Oil

Sector: Income Eligible

Fuel: Electric

Program Type: Prescriptive

Measure Category: HVAC

Measure Type: Heat Pumps

Measure Sub Type: Heat Pump Electrification

Program: B03a Single Family – Appliance Management

Measure Description

Full displacement of an existing inefficient propane or oil furnace with a high efficiency central ducted heat pump.

Baseline Description

The baseline is an existing inefficient furnace at 77.7% AFUE for a properly functioning unit and 83% AFUE when the customer would have installed a new furnace without program intervention.

Savings Principle

The high efficiency case is a new 4.7 ton 16 SEER/9.5 HSPF ducted central heat pump.

Savings Method

Deemed

Unit

Installation of a high efficiency central ducted heat pump

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heat Pumps - Oil	-8,437.0	-3.5300	83.91	0.00	0.00	0.00	0.00

Electric kWh Source: Guidehouse, Energy Optimization Fuel Displacement Impact and Process Study, MA20R24-B-EOEVAL

Electric kW Source: Guidehouse, Energy Optimization Fuel Displacement Impact and Process Study, MA20R24-B-EOEVAL

Gas Heat MMBtu Source: Guidehouse, Energy Optimization Fuel Displacement Impact and Process Study, MA20R24-B-EOEVAL

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heat Pumps - Oil	15	1.00	1.00		1.00	1.00	1.00	-0.02	0.65

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heat Pumps - Oil	44.30%	55.00%	0.40%	0.30%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Note: Consistent with MA TRM

CFwp Note: Consistent with MA TRM

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heat Pumps - Oil	0.00	0.00	0.04	0.01

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

One-time $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

One-time $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heat Pumps - Oil	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

HP Water Heaters

Sector: Income Eligible

Fuel: Electric

Program Type: Prescriptive

Measure Category: Appliances

Measure Type: Heat Pump Water Heaters

Measure Sub Type: Heat Pump Water Heaters

Program: B03a Single Family - Appliance Management

Measure Description

Installation of a heat pump water heater (HPWH) instead of an electric resistance water heater.

Baseline Description

The baseline efficiency case is a new, standard efficiency electric resistance hot water heater.

Savings Principle

The high efficiency case is a high efficiency heat pump water heater.

Savings Method

Deemed

Unit

Per Water Heater

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
HP Water Heaters	814.0	0.1800	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
HP Water Heaters	10	1.00	1.00		1.00	1.00	1.00	0.47	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
HP Water Heaters	39.00%	33.00%	15.00%	13.00%

Measure Life Source: Steven Winter Associates, Inc (2012). Heat Pump Water Heaters Evaluation of Field Installed Performance. Sponsored by National Grid and NSTAR

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
HP Water Heaters	0.00	0.00	4.64	0

Annual $ Source: Massachusetts Special and Cross-Cutting Research Area: Low-Income Single-Family Health- and Safety-Related Non-Energy Impacts (NEIs) Study, August 5, 2016. Prepared by: Three3, Inc. and NMR Group

NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
HP Water Heaters	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $1,800.00 / measure

Incentive: $1,800.00 / measure

LED Bulbs

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** LED Screw Base

Program: B03a Single Family - Appliance Management

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly longer lamp lifetimes.

Baseline Description

The baseline efficiency case is a combination of an incandescent bulb and halogen bulb.

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED lamp.

Savings Method

Deemed

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: 1,022.0.

Hours Source: Nexus Market Research, RLW Analytics and GDS Associates (2009). Residential Lighting Markdown Impact Evaluation. Prepared for Markdown and Buydown Program Sponsors in CT, MA, RI, and VT.

Hours Note: The average annual operating hours are 1,022 hours/year for rebated lights and calculated by vendor for home audit applications.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
LED Bulbs	18.0	0.0050	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
LED Bulbs	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
LED Bulbs	35.00%	31.00%	19.00%	15.00%

Measure Life Note: Based on MA EUL assumptions

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
LED Bulbs	0.00	0.00	0	3.00

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

One-time $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
LED Bulbs	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $8.50 / measure

Incentive: $8.50 / measure

Minisplit Heat Pumps - Electric Resistance

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** Heat Pumps | **Measure Sub Type:** Ductless

Program: B03a Single Family - Appliance Management

Measure Description

The purchase and installation of high efficiency mini-split heat pump system to replace an electric resistance heating system.

Baseline Description

The baseline efficiency case for heating is a residential electric resistance heating system.

The baseline efficiency case for cooling is a residential window AC unit with EER 9.8.

Savings Principle

The high efficiency case is an ENERGY STAR® qualified air-source heat pump.

Savings Method

Deemed

Unit

Installed high-efficiency air-source heat pump system for heating and cooling.

Savings Equation

Heating Gross kWh = Qty*deltakWh_heating

Cooling Gross kWh = Qty*deltakWh_cooling

Cooling Gross kW = Qty*deltakW

Where:

Qty = Total number of units.

deltakWh_heating = Average annual heating kWh reduction per unit.

deltakWh_cooling = Average annual cooling kWh reduction per unit.

deltakW = Average annual kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Minisplit Heat Pumps - Electric Resistance	6,549.0	2.8300	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Electric kW Source: RI_2022 Annual PLan Electric H&C Savings Workbook_06-14-2021

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Minisplit Heat Pumps - Electric Resistance	18	1.00	1.00		1.00	1.00	1.00	0.00	0.62

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Minisplit Heat Pumps - Electric Resistance	42.90%	57.10%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Minisplit Heat Pumps - Electric Resistance	0.00	0.00	310.82	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Minisplit Heat Pumps - Electric Resistance	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $16,000.00 / job

Incentive: $16,000.00 / job

Programmable Thermostat, Electric

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: B03a Single Family - Appliance Management

Measure Description

Installation of programmable thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule.

Baseline Description

The baseline efficiency case is an HVAC system providing space heating without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system providing space heating with a programmable thermostat installed.

Savings Method

Deemed

Unit

Installed programmable thermostat.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Gross MMBtu_Oil = Qty × deltaMMBtu_Oil

Gross MMBtu_Propane = Qty× deltaMMBtu_Propane

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

deltaMMBtu_Oil = Average annual oil reduction per unit

deltaMMBtu_Propane = Average annual propane reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Programmable Thermostat, Electric	251.7	0.1900	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Programmable Thermostat, Electric	19	1.00	1.00		1.00	1.00	1.00	0.34	0.21

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Programmable Thermostat, Electric	25.00%	30.00%	23.00%	22.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Programmable Thermostat, Electric	0.00	0.00	44.53	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Programmable Thermostat, Electric	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $150.00 / measure

Incentive: $150.00 / measure

Programmable Thermostat, Gas

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: B03a Single Family - Appliance Management

Measure Description

Installation of programmable thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule.

Baseline Description

The baseline efficiency case is an HVAC system providing space heating without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system providing space heating with a programmable thermostat installed.

Savings Method

Deemed

Unit

Installed programmable thermostat.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Gross MMBtu_Oil = Qty × deltaMMBtu_Oil

Gross MMBtu_Propane = Qty× deltaMMBtu_Propane

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

deltaMMBtu_Oil = Average annual oil reduction per unit

deltaMMBtu_Propane = Average annual propane reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Programmable Thermostat, Gas	11.2	0.0200	2.07	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Gas Heat MMBtu Source: MA Smart Thermostat Impact Study (RES 24) - Final Results

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Programmable Thermostat, Gas	19	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Programmable Thermostat, Gas	7.00%	4.00%	47.00%	42.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Programmable Thermostat, Gas	0.00	0.00	44.53	0

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Programmable Thermostat, Gas	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $150.00 / measure

Incentive: $150.00 / measure

Programmable Thermostat, Oil

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: B03a Single Family - Appliance Management

Measure Description

Installation of programmable thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule.

Baseline Description

The baseline efficiency case is an HVAC system providing space heating without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system providing space heating with a programmable thermostat installed.

Savings Method

Deemed

Unit

Installed programmable thermostat.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Gross MMBtu_Oil = Qty × deltaMMBtu_Oil

Gross MMBtu_Propane = Qty× deltaMMBtu_Propane

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

deltaMMBtu_Oil = Average annual oil reduction per unit

deltaMMBtu_Propane = Average annual propane reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Programmable Thermostat, Oil	8.7	0.0100	0.00	0.00	0.00	2.07	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Oil MMBtu Source: MA Smart Thermostat Impact Study (RES 24) - Final Results

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Programmable Thermostat, Oil	19	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Programmable Thermostat, Oil	7.00%	4.00%	47.00%	42.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Programmable Thermostat, Oil	0.00	0.00	44.53	0

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Programmable Thermostat, Oil	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $150.00 / measure

Incentive: $150.00 / measure

Programmable Thermostat, Other

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: B03a Single Family - Appliance Management

Measure Description

Installation of programmable thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule.

Baseline Description

The baseline efficiency case is an HVAC system providing space heating without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system providing space heating with a programmable thermostat installed.

Savings Method

Deemed

Unit

Installed programmable thermostat.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Gross MMBtu_Oil = Qty × deltaMMBtu_Oil

Gross MMBtu_Propane = Qty× deltaMMBtu_Propane

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

deltaMMBtu_Oil = Average annual oil reduction per unit

deltaMMBtu_Propane = Average annual propane reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Programmable Thermostat, Other	11.2	0.0200	0.00	0.00	0.00	0.00	2.07

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Propane MMBtu Source: MA Smart Thermostat Impact Study (RES 24) - Final Results

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Programmable Thermostat, Other	19	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Programmable Thermostat, Other	7.00%	4.00%	47.00%	42.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Programmable Thermostat, Other	0.00	0.00	44.53	0

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Programmable Thermostat, Other	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $150.00 / measure

Incentive: $150.00 / measure

Replacement Freezer

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** Freezers | **Measure Sub Type:** Freezer

Program: B03a Single Family - Appliance Management

Measure Description

This measure covers the replacement of an existing inefficient freezer with a new energy efficient model.

Baseline Description

The baseline efficiency case for both the replaced and baseline new freezer is represented by the existing freezer. It is assumed that low-income customers would replace their freezers with a used inefficient unit.

Savings Principle

The high efficiency case is a new high efficiency freezer.

Savings Method

Calculated using deemed inputs

Unit

Installed high-efficiency freezer.

Savings Equation

Gross kWh = Qty × (kWh_base - kWh_ee)

Gross kW = Qty × (kWh_base - kWh_ee) / Hours

Where:

Qty = Total number of units.

kW_base = Deemed average demand per baseline unit.

kW_ee = Deemed average demand per high-efficiency unit.

Hours = Deemed average annualoperating hours.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Replacement Freezer	333.0	0.0500	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Replacement Freezer	19	1.00	1.00		1.00	1.00	1.00	0.91	0.68

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Replacement Freezer	29.00%	34.00%	17.00%	21.00%

Measure Life Note: National Grid assumption based on regional PA working groups.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Replacement Freezer	0.00	0.00	1.40	26.61

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

One-time $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Replacement Freezer	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $550.00 / measure

Incentive: $550.00 / measure

Replacement Refrigerator

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Appliances | **Measure Type:** Refrigerators | **Measure Sub Type:** Refrigerator

Program: B03a Single Family - Appliance Management

Measure Description

This measure covers the replacement of an existing inefficient refrigerator with a new ENERGY STAR® rated refrigerator.

Baseline Description

The baseline efficiency case is the existing refrigerator. It is assumed that low-income customers would otherwise replace their refrigerators with a used inefficient unit.

Savings Principle

The high efficiency case is an ENERGY STAR® rated refrigerator that meets the ENERGY STAR® criteria for full-sized refrigerators (7.75 cubic feet), using at least 20% less energy than models meeting the minimum Federal government standard.

Savings Method

Calculated using deemed inputs

Unit

Installed high-efficiency refrigerator.

Savings Equation

Gross kWh = Qty × (kWh_base - kWh_ee)

Gross kW = Qty × (kWh_base - kWh_ee) / Hours

Where:

Qty = Total number of units.

kW_base = Deemed average demand per baseline unit.

kW_ee = Deemed average demand per high-efficiency unit.

Hours = Deemed average annualoperating hours.

Hours: 8,760.0.

Hours Note: The average annual operating hours are 8760 hours/year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Replacement Refrigerator	467.0	0.0800	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Replacement Refrigerator	19	1.00	1.00		1.00	1.00	1.00	0.79	0.65

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Replacement Refrigerator	29.00%	32.00%	18.00%	21.00%

Measure Life Note: National Grid assumption based on regional PA working groups.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Replacement Refrigerator	0.00	0.00	1.40	26.61

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

One-time $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Replacement Refrigerator	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $1,100.00 / measure

Incentive: $1,100.00 / measure

Smart Strips

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Plug Load | **Measure Type:** Smart Strips | **Measure Sub Type:** Smart Strip

Program: B03a Single Family - Appliance Management

Measure Description

The basic measures switches off plug load using current sensors and switching devices which turn off plug load when electrical current drops below threshold low levels. The advanced measure shuts devices off after it no longer senses activity from their infrared controls.

Baseline Description

The baseline efficiency case is the absence power strip and leaving peripheral devices plugged in or using a power surge protector and leaving peripheral devices on.

Savings Principle

The high efficiency case is the use of a smart strip or advanced smart strip.

Savings Method

Calculated using deemed inputs

Unit

Rebated smart strip.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: 8,760.0.

Hours Note: Since the power strip is assumed to be plugged in all year, the savings are based on 8,760 operational hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Smart Strips	105.0	0.0200	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, Inc. (2019). Advanced Power Strip Metering Study- Revised

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Smart Strips	5	0.81	1.00		0.92	0.92	0.92	0.58	0.86

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Smart Strips	32.00%	35.00%	15.00%	18.00%

Measure Life Note: Massachusetts Common Assumption

ISR Source: NMR Group, Inc. (2019). Advanced Power Strip Metering Study- Revised

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: NMR Group, Inc. (2019). Advanced Power Strip Metering Study- Revised

RRsp Source: NMR Group, Inc. (2019). Advanced Power Strip Metering Study- Revised

RRwp Source: NMR Group, Inc. (2019). Advanced Power Strip Metering Study- Revised

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Smart Strips	0.00	0.00	0	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Smart Strips	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $20.00 / measure

Incentive: $20.00 / measure

Waterbed Mattress Replacement

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Flow Control Measures

Program: B03a Single Family - Appliance Management

Measure Description

Replacement of waterbed mattress with a standard mattress.

Baseline Description

The baseline efficiency case is an existing waterbed mattress.

Savings Principle

The high efficiency case is a new standard mattress.

Savings Method

Deemed

Unit

Replacement of existing waterbed mattress with new standard mattress.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Waterbed Mattress Replacement	872.0	0.1600	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Waterbed Mattress Replacement	10	1.00	1.00		1.00	1.00	1.00	0.58	0.86

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Waterbed Mattress Replacement	32.00%	35.00%	15.00%	18.00%

Measure Life Source: http://www.serta.com/best-mattress-FAQs-mattresses-Serta-Number--1-Best-Selling-Mattress.html

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Waterbed Mattress Replacement	0.00	0.00	0	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Waterbed Mattress Replacement	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $650.00 / measure

Incentive: $650.00 / measure

Weatherization, Electric

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Insulation & Air sealing | **Measure Sub Type:** Weatherization

Program: B03a Single Family - Appliance Management

Measure Description

Installation of weatherization measures such as air sealing and insulation in homes heated with electricity, oil, or propane. Non-heating electric savings are achieved from reduced fan run time for heating and cooling systems.

Baseline Description

The baseline efficiency case is any existing home shell measures.

Savings Principle

The high efficiency case can be a combination of increased insulation, air sealing, duct sealing, and other improvements to the home shell.

Savings Method

Deemed

Unit

Completed weatherization project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Gross MMBtu_Oil = Qty × deltaMMBtu_Oil

Gross MMBtu_Propane = Qty× deltaMMBtu_Propane

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

deltaMMBtu_Oil = Average annual oil reduction per unit

deltaMMBtu_Propane = Average annual propane reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Weatherization, Electric	1,231.0	0.9500	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Weatherization, Electric	20	1.00	1.00		1.00	1.00	1.00	0.34	0.21

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Weatherization, Electric	25.00%	30.00%	23.00%	22.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Weatherization, Electric	0.00	0.00	558.21	0

Annual $ Source: Massachusetts Special and Cross-Cutting Research Area: Low-Income Single-Family Health- and Safety-Related Non-Energy Impacts (NEIs) Study, August 5, 2016. Prepared by: Three3, Inc. and NMR Group

NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Weatherization, Electric	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $5,500.00 / job

Incentive: $5,500.00 / job

Weatherization, Oil

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Insulation & Air sealing | **Measure Sub Type:** Weatherization

Program: B03a Single Family - Appliance Management

Measure Description

Installation of weatherization measures such as air sealing and insulation in homes heated with electricity, oil, or propane. Non-heating electric savings are achieved from reduced fan run time for heating and cooling systems.

Baseline Description

The baseline efficiency case is any existing home shell measures.

Savings Principle

The high efficiency case can be a combination of increased insulation, air sealing, duct sealing, and other improvements to the home shell.

Savings Method

Deemed

Unit

Completed weatherization project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Gross MMBtu_Oil = Qty × deltaMMBtu_Oil

Gross MMBtu_Propane = Qty× deltaMMBtu_Propane

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

deltaMMBtu_Oil = Average annual oil reduction per unit

deltaMMBtu_Propane = Average annual propane reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Weatherization, Oil	95.0	0.0700	0.00	0.00	0.00	13.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Oil MMBtu Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Weatherization, Oil	20	1.00	1.00		1.00	1.00	1.00	0.34	0.21

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Weatherization, Oil	25.30%	29.90%	23.10%	21.70%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Weatherization, Oil	0.00	0.00	558.21	0

Annual $ Source: Massachusetts Special and Cross-Cutting Research Area: Low-Income Single-Family Health- and Safety-Related Non-Energy Impacts (NEIs) Study, August 5, 2016. Prepared by: Three3, Inc. and NMR Group

NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Weatherization, Oil	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $5,500.00 / job

Incentive: $5,500.00 / job

Window - Electric Resistance

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, electric resistance

Program: B03a Single Family - Appliance Management

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Window - Electric Resistance	254.0	0.1300	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Window - Electric Resistance	25	1.00	1.00		1.00	1.00	1.00	0.33	0.43

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Window - Electric Resistance	45.00%	44.00%	6.00%	5.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Window - Electric Resistance	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Window - Electric Resistance	0.00	0.00	0.00	1.00

NTG Source: MA 2022 TRM

Window - Heat Pump

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, heat pump

Program: B03a Single Family - Appliance Management

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Window - Heat Pump	127.0	0.0900	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Window - Heat Pump	25	1.00	1.00		1.00	1.00	1.00	0.37	0.22

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Window - Heat Pump	26.00%	29.00%	24.00%	21.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Window - Heat Pump	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Window - Heat Pump	0.00	0.00	0.00	1.00

NTG Source: MA 2022 TRM

Window - Oil

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, oil

Program: B03a Single Family - Appliance Management

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Window - Oil	7.0	0.0100	1.27	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Gas Heat MMBtu Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Window - Oil	25	1.00	1.00		1.00	1.00	1.00	0.37	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Window - Oil	49.80%	42.60%	3.60%	4.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Window - Oil	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Window - Oil	0.00	0.00	0.00	1.00

NTG Source: MA 2022 TRM

Window - Propane

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, propane

Program: B03a Single Family - Appliance Management

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Window - Propane	7.0	0.0100	1.27	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Gas Heat MMBtu Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Window - Propane	25	1.00	1.00		1.00	1.00	1.00	0.37	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Window - Propane	49.80%	42.60%	3.60%	4.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Window - Propane	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Window - Propane	0.00	0.00	0.00	1.00

NTG Source: MA 2022 TRM

Window AC Replacements

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Cooling | **Measure Sub Type:** Window AC

Program: B03a Single Family - Appliance Management

Measure Description

Replacement of existing inefficient room air conditioners with more efficient models. This is only offered as a measure when an AC timer would not reduce usage during the peak period.

Baseline Description

The baseline efficiency case is the existing air conditioning unit.

Savings Principle

The high efficiency case is the high efficiency room air conditioning unit.

Savings Method

Deemed

Unit

Replacement of existing window AC with high-efficiency window AC.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Hours Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Hours Note: Calculated for Multifamily applications and not applicable for single family.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Window AC Replacements	71.0	0.1100	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Window AC Replacements	12	1.00	1.00		1.00	1.00	1.00	0.33	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Window AC Replacements	3.00%	2.00%	48.00%	47.00%

Measure Life Source: Environmental Protection Agency (2009). Life Cycle Cost Estimate for ENERGY STAR Room Air Conditioner. Interactive Excel Spreadsheet found at www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/CalculatorConsumerRoomAC.xls

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Window AC Replacements	0.00	0.00	49.50	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Window AC Replacements	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $385.00 / measure

Incentive: $385.00 / measure

AERATOR Elec

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Faucet Aerator

Program: B03b Low Income Retrofit Multifamily

Measure Description

Installation of a faucet aerator with a flow rate of 1.5 GPM or less on an existing faucet with high flow in a commercial setting with service water heated by electricity.

Baseline Description

The baseline efficiency case is 2.2 GPM or greater faucet.

Savings Principle

The high efficiency case is a faucet with 1.5 GPM or less aerator installed.

Savings Method

Deemed

Unit

Installed faucet aerator.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
AERATOR Elec	38.0	0.0091	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Electric kW Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
AERATOR Elec	7	0.90	1.00		1.00	1.00	1.00	0.31	0.81

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
AERATOR Elec	41.50%	31.40%	15.20%	11.90%

ISR Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRsp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRwp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
AERATOR Elec	359.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Annual $ Source: NMR (2018, 2019). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). TXC50 - LIMF Market Rate MF NEI - Phase I.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
AERATOR Elec	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

AERATOR Oil

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Faucet Aerator

Program: B03b Low Income Retrofit Multifamily

Measure Description

Installation of a faucet aerator with a flow rate of 1.5 GPM or less on an existing faucet with high flow in a commercial setting with service water heated by electricity.

Baseline Description

The baseline efficiency case is 2.2 GPM or greater faucet.

Savings Principle

The high efficiency case is a faucet with 1.5 GPM or less aerator installed.

Savings Method

Deemed

Unit

Installed faucet aerator.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
AERATOR Oil	0	0	0.00	0.00	0.00	0.20	0.00

Oil MMBtu Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
AERATOR Oil	7	0.90	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
AERATOR Oil	0.00%	0.00%	0.00%	0.00%

Measure Life Note: Massachusetts Common Assumption

ISR Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRsp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRwp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
AERATOR Oil	359.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Annual $ Source: NMR (2018, 2019). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). TXC50 - LIMF Market Rate MF NEI - Phase I.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
AERATOR Oil	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

AIR SEALING ELEC WITH AC

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Building Shell | **Measure Type:** Air Sealing | **Measure Sub Type:** Electric with AC

Program: B03b Low Income Retrofit Multifamily

Measure Description

Thermal shell air leaks are sealed through strategic use and location of air-tight materials.

Baseline Description

The baseline efficiency case is the existing building before the air sealing measure is implemented. The baseline building is characterized by the existing CFM50 measurement (CFM50PRE) for single family homes, or the existing air changes per hour (ACHPRE).

Savings Principle

The high efficiency case is the existing building after the air sealing measure is implemented. The high efficiency building is characterized by the new CFM50 measurement for single family homes (CFM50POST), or the new air changes per hour (ACHPOST) for multi-family facilities, which is measured after the air sealing measure is implemented.

Savings Method

Calculated using site-specific inputs

Unit

Completed air sealing project.

Savings Equation

Gross kWh = Stories × SQFT × (CFM/SQFT_pre - CFM/SQFT_post) × deltakWh/CFM

Gross kW = Gross kWh × kW/kWh

Where:

Stories = Total stories in the multi-family building

SQFT = Area of building in square feet

CFM/SQFT_pre = Estimate of pre-retrofit air leakagein CFM/SQFT based on number of stories in the building and air-tightness ratings of the existing roof and floor

CFM/SQFT_post = Estimate of post-retrofit air leakage in CFM/SQFT based on number of stories in the building and air-tightness ratings of theimproved roof and floor

deltakWh/CFM = Average annual kWh reduction per CFM

Gross kWh = Stories × SQFT × (CFM/SQFT_pre - CFM/SQFT_post) × deltakWh/CFM

kW/kWh = Average kW reduction per kWh reduction

Hours: 4,644.0.

Hours Source: NOAA Weather data: An average BASE 60 Annual Heating Degree Day value for weather stations in Rhode Island and southeastern Massachusetts based on NOAA 30-year data.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
AIR SEALING ELEC WITH AC	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
AIR SEALING ELEC WITH AC	20	1.00	1.00		1.00	1.00	1.00	0.33	0.22

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
AIR SEALING ELEC WITH AC	25.40%	30.60%	22.40%	21.60%

Measure Life Source: 'ComEd Effective Useful Life Research Report', May 2018

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
AIR SEALING ELEC WITH AC	0.00	0.00	368.88	0

Annual $ Source: NMR Group, Inc (2021). TXC50 Low Income Multifamily NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
AIR SEALING ELEC WITH AC	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

AIR SEALING OIL

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Building Shell | **Measure Type:** Air Sealing | **Measure Sub Type:** Oil

Program: B03b Low Income Retrofit Multifamily

Measure Description

Thermal shell air leaks are sealed through strategic use and location of air-tight materials.

Baseline Description

The baseline efficiency case is the existing building before the air sealing measure is implemented. The baseline building is characterized by the existing CFM50 measurement (CFM50PRE) for single family homes, or the existing air changes per hour (ACHPRE).

Savings Principle

The high efficiency case is the existing building after the air sealing measure is implemented. The high efficiency building is characterized by the new CFM50 measurement for single family homes (CFM50POST), or the new air changes per hour (ACHPOST) for multi-family facilities, which is measured after the air sealing measure is implemented.

Savings Method

Calculated using site-specific inputs

Unit

Completed air sealing project.

Savings Equation

Gross kWh = Stories × SQFT × (CFM/SQFT_pre - CFM/SQFT_post) × deltakWh/CFM

Gross kW = Gross kWh × kW/kWh

Where:

Stories = Total stories in the multi-family building

SQFT = Area of building in square feet

CFM/SQFT_pre = Estimate of pre-retrofit air leakagein CFM/SQFT based on number of stories in the building and air-tightness ratings of the existing roof and floor

CFM/SQFT_post = Estimate of post-retrofit air leakage in CFM/SQFT based on number of stories in the building and air-tightness ratings of theimproved roof and floor

deltakWh/CFM = Average annual kWh reduction per CFM

Gross kWh = Stories × SQFT × (CFM/SQFT_pre - CFM/SQFT_post) × deltakWh/CFM

kW/kWh = Average kW reduction per kWh reduction

Hours: 4,644.0.

Hours Source: NOAA Weather data: An average BASE 60 Annual Heating Degree Day value for weather stations in Rhode Island and southeastern Massachusetts based on NOAA 30-year data.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
AIR SEALING OIL	Calc	Calc	0.00	0.00	0.00	Calc	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Oil MMBtu Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
AIR SEALING OIL	20	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
AIR SEALING OIL	6.59%	3.85%	47.32%	42.24%

Measure Life Source: 'ComEd Effective Useful Life Research Report', May 2018

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
AIR SEALING OIL	0.00	0.00	368.88	0

Annual $ Source: NMR Group, Inc (2021). TXC50 Low Income Multifamily NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
AIR SEALING OIL	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Common Ext LED Bulbs

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Lighting | **Measure Type:** Exterior | **Measure Sub Type:** Common LED

Program: B03b Low Income Retrofit Multifamily

Measure Description

The installation of ENERGY STAR® LED outdoor bulbs.

Baseline Description

The baseline efficiency case is the existing installed bulb.

Savings Principle

The high efficiency case is bulbs that use fewer watts.

Savings Method

Deemed

Unit

Installed bulb

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Common Ext LED Bulbs	162.0	0.0405	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Electric kW Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Common Ext LED Bulbs	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Common Ext LED Bulbs	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Navigant (2018). Multi-Family Program Impact and Net-to-Gross Evaluation (RES 44). Prepared for the MA Program Administrators.

SPF Note: Savings persistence is assumed to be 100%.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Common Ext LED Bulbs	0.00	0.00	17.39	10.83

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Common Ext LED Bulbs	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Common Ext LED Fixture

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** Common LED

Program: B03b Low Income Retrofit Multifamily

Measure Description

The installation of ENERGY STAR® compact fluorescent (CFL) indoor fixtures. Compact fluorescent fixtures offer comparable luminosity to incandescent fixtures at significantly

less wattage and significantly longer lifetimes. Hardwired fluorescent fixturesoffer comparable luminosity to incandescent fixtures at significantly lower wattage and offer significantly longer lifespan.

Baseline Description

The baseline efficiency case is the existing lighting hours of use.

Savings Principle

The high efficiency case is lights that are using fewer hours, reducing energy.

Savings Method

Calculated using site-specific inputs

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Note: Multifamily common area hours are site specific

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Common Ext LED Fixture	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Common Ext LED Fixture	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Common Ext LED Fixture	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Navigant (2018). Multi-Family Program Impact and Net-to-Gross Evaluation (RES 44). Prepared for the MA Program Administrators.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Common Ext LED Fixture	0.00	0.00	17.39	11.33

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Common Ext LED Fixture	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Common Ext Reflector

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Exterior | **Measure Sub Type:** Common Reflector

Program: B03b Low Income Retrofit Multifamily

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly longer lamp lifetimes.

Baseline Description

The baseline efficiency case is blend of incandescent, halogens, CFLs and other bulbs types, as provided by market research or for EISA exempt bulbs and bulbs installed through an home energy audit, the base line is a 65 Watt incandescent.

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED fixture.

Savings Method

Calculated using site-specific inputs

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Note: Multifamily common area hours are site specific

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Common Ext Reflector	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Common Ext Reflector	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Common Ext Reflector	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Navigant (2018). Multi-Family Program Impact and Net-to-Gross Evaluation (RES 44). Prepared for the MA Program Administrators.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Common Ext Reflector	0.00	0.00	17.39	10.83

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Common Ext Reflector	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Common Int EISA Exempt

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** Common EISA

Program: B03b Low Income Retrofit Multifamily

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly longer lamp lifetimes.

Baseline Description

The baseline efficiency case is blend of incandescent, halogens, CFLs and other bulbs types, as provided by market research or for EISA exempt bulbs and bulbs installed through an home energy audit, the base line is a 65 Watt incandescent.

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED fixture.

Savings Method

Calculated using site-specific inputs

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Note: Multifamily common area hours are site specific

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Common Int EISA Exempt	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Common Int EISA Exempt	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Common Int EISA Exempt	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Navigant (2018). Multi-Family Program Impact and Net-to-Gross Evaluation (RES 44). Prepared for the MA Program Administrators.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Common Int EISA Exempt	0.00	0.00	17.39	10.83

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Common Int EISA Exempt	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Common Int LED Bulbs

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** Common LED

Program: B03b Low Income Retrofit Multifamily

Measure Description

The installation of ENERGY STAR® LED indoor bulbs.

Baseline Description

The baseline efficiency case is the existing installed bulb.

Savings Principle

The high efficiency case is bulbs that use fewer watts.

Savings Method

Deemed

Unit

Installed bulb

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Common Int LED Bulbs	179.0	0.0448	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Electric kW Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Common Int LED Bulbs	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Common Int LED Bulbs	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Navigant (2018). Multi-Family Program Impact and Net-to-Gross Evaluation (RES 44). Prepared for the MA Program Administrators.

SPF Note: Savings persistence is assumed to be 100%.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Common Int LED Bulbs	0.00	0.00	17.39	10.83

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Common Int LED Bulbs	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Common Int LED Fixture

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** Common LED

Program: B03b Low Income Retrofit Multifamily

Measure Description

The installation of ENERGY STAR® compact fluorescent (CFL) indoor fixtures. Compact fluorescent fixtures offer comparable luminosity to incandescent fixtures at significantly

less wattage and significantly longer lifetimes. Hardwired fluorescent fixturesoffer comparable luminosity to incandescent fixtures at significantly lower wattage and offer significantly longer lifespan.

Baseline Description

The baseline efficiency case is a blend of incandescent, compact fluorescent, and halogen lamps. For home audit applications, the baseline is the existing fixture.

Savings Principle

The high efficiency case is an ENERGY STAR® qualified compact fluorescent light fixture wired for exclusive use with pin-based CFLs.

Savings Method

Calculated using site-specific inputs

Unit

Rebated lamp or fixture

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Note: Multifamily common area hours are site specific

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Common Int LED Fixture	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Common Int LED Fixture	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Common Int LED Fixture	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Navigant (2018). Multi-Family Program Impact and Net-to-Gross Evaluation (RES 44). Prepared for the MA Program Administrators.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Common Int LED Fixture	0.00	0.00	17.39	11.33

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Common Int LED Fixture	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Common Int Reflector

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** Common Reflector

Program: B03b Low Income Retrofit Multifamily

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly longer lamp lifetimes.

Baseline Description

The baseline efficiency case is blend of incandescent, halogens, CFLs and other bulbs types, as provided by market research or for EISA exempt bulbs and bulbs installed through an home energy audit, the base line is a 65 Watt incandescent.

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED fixture.

Savings Method

Calculated using site-specific inputs

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Source: NMR Group, Northeast Residential Lighting Hours-of-Use Study, May 2014

Hours Note: Multifamily common area hours are site specific

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Common Int Reflector	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Common Int Reflector	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Common Int Reflector	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Navigant (2018). Multi-Family Program Impact and Net-to-Gross Evaluation (RES 44). Prepared for the MA Program Administrators.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Common Int Reflector	0.00	0.00	17.39	10.83

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Common Int Reflector	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Custom

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Multi-family | **Measure Sub Type:** Low Income

Program: B03b Low Income Retrofit Multifamily

Measure Description

Vendors install a variety of measures at multifamily facilities. Includes custom low income retrofit multifamily measures.

Baseline Description

For retrofit projects, the baseline efficiency case is the same as the existing, or pre-retrofit, case for the custom low income retrofit multifamily measures.

Savings Principle

The high efficiency scenario is specific to the facility and may include one or more energy efficiency

Savings Method

Calc

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Custom	Calc	Calc	Calc	Calc	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Custom	multi	1.00	1.00		0.86	1.00	1.00	0.00	0.43

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Custom	43.13%	56.87%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Custom	0.00	0.00	799.24	0

Annual $ Source: NMR Group, Inc (2021). TXC50 Low Income Multifamily NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Custom	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Dwelling Ext LED Fixture

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Exterior | **Measure Sub Type:** Dwelling LED

Program: B03b Low Income Retrofit Multifamily

Measure Description

The installation of ENERGY STAR® compact fluorescent (CFL) indoor fixtures. Compact fluorescent fixtures offer comparable luminosity to incandescent fixtures at significantly

less wattage and significantly longer lifetimes. Hardwired fluorescent fixturesoffer comparable luminosity to incandescent fixtures at significantly lower wattage and offer significantly longer lifespan.

Baseline Description

The baseline efficiency case is a blend of incandescent, compact fluorescent, and halogen lamps. For home audit applications, the baseline is the existing fixture.

Savings Principle

The high efficiency case is an ENERGY STAR® qualified compact fluorescent light fixture wired for exclusive use with pin-based CFLs.

Savings Method

Calculated using site-specific inputs

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Source: NMR Group, Northeast Residential Lighting Hours-of-Use Study, May 2014

Hours Note: Multifamily dwelling unit hours defined by room type from NMR HOU study.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dwelling Ext LED Fixture	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dwelling Ext LED Fixture	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dwelling Ext LED Fixture	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dwelling Ext LED Fixture	0.00	0.00	17.39	11.33

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dwelling Ext LED Fixture	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Dwelling Ext Reflector

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Exterior | **Measure Sub Type:** Dwelling Reflector

Program: B03b Low Income Retrofit Multifamily

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly longer lamp lifetimes.

Baseline Description

The baseline efficiency case is blend of incandescent, halogens, CFLs and other bulbs types, as provided by market research or for EISA exempt bulbs and bulbs installed through an home energy audit, the base line is a 65 Watt incandescent.

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED fixture.

Savings Method

Calculated using site-specific inputs

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Note: Multifamily dwelling unit hours defined by room type from NMR HOU study.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dwelling Ext Reflector	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dwelling Ext Reflector	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dwelling Ext Reflector	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

ISR Source: Navigant (2018). Multi-Family Program Impact and Net-to-Gross Evaluation (RES 44). Prepared for the MA Program Administrators.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dwelling Ext Reflector	0.00	0.00	17.39	10.83

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dwelling Ext Reflector	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Dwelling Int EISA Exempt

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** Dwelling EISA

Program: B03b Low Income Retrofit Multifamily

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly longer lamp lifetimes.

Baseline Description

The baseline efficiency case is blend of incandescent, halogens, CFLs and other bulbs types, as provided by market research or for EISA exempt bulbs and bulbs installed through an home energy audit, the base line is a 65 Watt incandescent.

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED fixture.

Savings Method

Calculated using site-specific inputs

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Source: NMR Group, Northeast Residential Lighting Hours-of-Use Study, May 2014

Hours Note: Multifamily dwelling unit hours defined by room type from NMR HOU study.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dwelling Int EISA Exempt	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dwelling Int EISA Exempt	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dwelling Int EISA Exempt	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dwelling Int EISA Exempt	0.00	0.00	17.39	10.83

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dwelling Int EISA Exempt	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Dwelling Int LED Bulbs

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** Dwelling LED

Program: B03b Low Income Retrofit Multifamily

Measure Description

The installation of ENERGY STAR® LED indoor bulbs.

Baseline Description

The baseline efficiency case is the existing installed bulb.

Savings Principle

The high efficiency case is bulbs that use fewer watts.

Savings Method

Deemed

Unit

Installed bulb

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dwelling Int LED Bulbs	18.0	0.0045	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Electric kW Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dwelling Int LED Bulbs	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dwelling Int LED Bulbs	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

SPF Note: Savings persistence is assumed to be 100%.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dwelling Int LED Bulbs	0.00	0.00	17.39	10.83

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dwelling Int LED Bulbs	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Dwelling Int LED Fixture

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** Dwelling LED

Program: B03b Low Income Retrofit Multifamily

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly longer lamp lifetimes.

Baseline Description

The baseline efficiency case is blend of incandescent, CFLs and other bulbs types, as provided by market research or for a home energy audit, the base line is a 65 Watt incandescent.

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED fixture.

Savings Method

Calculated using site-specific inputs

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Source: NMR Group, Northeast Residential Lighting Hours-of-Use Study, May 2014

Hours Note: Multifamily dwelling unit hours defined by room type from NMR HOU study.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dwelling Int LED Fixture	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dwelling Int LED Fixture	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dwelling Int LED Fixture	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dwelling Int LED Fixture	0.00	0.00	17.39	11.33

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dwelling Int LED Fixture	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Dwelling Int Reflector

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** Dwelling Reflector

Program: B03b Low Income Retrofit Multifamily

Measure Description

The installation of Light-Emitting Diode (LED) screw-in bulbs and fixtures. LEDs offer comparable luminosity to incandescent bulbs at significantly less wattage and significantly longer lamp lifetimes.

Baseline Description

The baseline efficiency case is blend of incandescent, halogens, CFLs and other bulbs types, as provided by market research or for EISA exempt bulbs and bulbs installed through an home energy audit, the base line is a 65 Watt incandescent.

Savings Principle

The high efficiency case is and ENERGY STAR® qualified LED fixture.

Savings Method

Calculated using site-specific inputs

Unit

Rebated lamp or fixture.

Savings Equation

Gross kWh = [(QTY_pre × Watts_pre × Hours_base) - (QTY_ee × Watts_ee × Hours_ee)]/1000 × 52

Gross kW = [(QTY_pre × Watts_pre) - (QTY_ee × Watts_ee)]/1000

Where:

QTY_pre = Quantity of pre-retrofit fixtures/bulbs

QTY_ee = Quantity of efficient fixtures/bulbs installed

Watts_pre = Rated watts of pre-retrofit fixtures/bulbs

Watts_ee = Rated watts of efficient fixtures/bulbs installed

Hours_pre = Weekly hours of operation for pre-retrofit case lighting fixtures/bulbs

Hours_ee = Weekly hours of operation for efficient lighting fixtures/bulbs

1000 = Watts per kW

52 = Weeks per year

Hours: N/A.

Hours Source: NMR Group, Northeast Residential Lighting Hours-of-Use Study, May 2014

Hours Note: Multifamily dwelling unit hours defined by room type from NMR HOU study.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dwelling Int Reflector	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dwelling Int Reflector	1	1.00	1.00		1.00	1.00	1.00	0.55	0.85

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dwelling Int Reflector	35.11%	30.72%	19.04%	15.12%

Measure Life Note: Based on MA EUL assumptions

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dwelling Int Reflector	0.00	0.00	17.39	10.83

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

One-time $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dwelling Int Reflector	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Heating System Retrofit-Boiler

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Heating | **Measure Sub Type:** Retrofit Boiler

Program: B03b Low Income Retrofit Multifamily

Measure Description

The installation of high efficiency heating systems.

Baseline Description

The baseline is the existing heating system.

Savings Principle

The high efficiency case includes replacing heating systems with higher efficiency systems.

Savings Method

Calculated using site-specific inputs

Unit

Heating system

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heating System Retrofit-Boiler	0	0	0.00	0.00	0.00	20.40	0.00

Oil MMBtu Source: The Cadmus Group, Inc. (2012). Low Income Single Family Impact Evaluation. Prepared for the Electric and Gas Program Administrators of Massachusetts.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heating System Retrofit-Boiler	23	1.00	1.00		0.86	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heating System Retrofit-Boiler	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

CFwp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heating System Retrofit-Boiler	0.00	0.00	799.24	0

Annual $ Source: NMR Group, Inc (2021). TXC50 Low Income Multifamily NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heating System Retrofit-Boiler	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Heating System Retrofit-Furnace

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Heating | **Measure Sub Type:** Retrofit Furnace

Program: B03b Low Income Retrofit Multifamily

Measure Description

The installation of high efficiency heating systems.

Baseline Description

The baseline is the existing heating system.

Savings Principle

The high efficiency case includes replacing heating systems with higher efficiency systems.

Savings Method

Calculated using site-specific inputs

Unit

Heating system

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heating System Retrofit-Furnace	132.0	0.0840	0.00	0.00	0.00	14.30	0.00

Electric kWh Source: The Cadmus Group, Inc. (2012). Low Income Single Family Impact Evaluation. Prepared for the Electric and Gas Program Administrators of Massachusetts.

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Oil MMBtu Source: The Cadmus Group, Inc. (2012). Low Income Single Family Impact Evaluation. Prepared for the Electric and Gas Program Administrators of Massachusetts.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heating System Retrofit-Furnace	17	1.00	1.00		0.86	1.00	1.00	0.00	0.45

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heating System Retrofit-Furnace	44.60%	55.40%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heating System Retrofit-Furnace	0.00	0.00	799.24	0

Annual $ Source: NMR Group, Inc (2021). TXC50 Low Income Multifamily NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heating System Retrofit-Furnace	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

INSULATION ELEC WITH AC

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Building Shell | **Measure Type:** Insulation | **Measure Sub Type:** Electric with AC

Program: B03b Low Income Retrofit Multifamily

Measure Description

Shell insulation upgrades applied in existing facilities including improved insulation in attics, basements and sidewalls.

Baseline Description

The baseline efficiency case is any existing home shell measures.

Savings Principle

The high efficiency case includes increased weatherization insulation levels.

Savings Method

Calculated using site-specific inputs

Unit

Completed insulation project.

Savings Equation

Gross kWh = SQFT × deltakWh/SQFT × (1/R_pre - 1/R_post)

Gross kW = Gross kWh × kW/kWh

Where:

SQFT = Square feet of insulation installed

deltakWh/SQFT = Average annual kWh reduction per SQFT of insulation

R_pre = R-Value of the existing insulation

R_post =R-Value of the new installed insulation

Gross kWh = Stories × SQFT × (CFM/SQFT_pre - CFM/SQFT_post) × deltakWh/CFM

kW/kWh = Average annual kW reduction per kWh reduction

Hours: 4,644.0.

Hours Source: NOAA Weather data: An average BASE 60 Annual Heating Degree Day value for weather stations in Rhode Island and southeastern Massachusetts based on NOAA 30-year data.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
INSULATION ELEC WITH AC	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
INSULATION ELEC WITH AC	25	1.00	1.00		0.86	1.00	1.00	0.33	0.22

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
INSULATION ELEC WITH AC	25.42%	30.57%	22.44%	21.58%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
INSULATION ELEC WITH AC	0.00	0.00	368.88	0

Annual $ Source: NMR Group, Inc (2021). TXC50 Low Income Multifamily NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
INSULATION ELEC WITH AC	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

INSULATION OIL

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Building Shell | **Measure Type:** Insulation | **Measure Sub Type:** Oil

Program: B03b Low Income Retrofit Multifamily

Measure Description

Shell insulation upgrades applied in existing facilities including improved insulation in attics, basements and sidewalls.

Baseline Description

The baseline efficiency case is any existing home shell measures.

Savings Principle

The high efficiency case includes increased weatherization insulation levels.

Savings Method

Calculated using site-specific inputs

Unit

Completed insulation project.

Savings Equation

Gross kWh = SQFT × deltakWh/SQFT × (1/R_pre - 1/R_post)

Gross kW = Gross kWh × kW/kWh

Where:

SQFT = Square feet of insulation installed

deltakWh/SQFT = Average annual kWh reduction per SQFT of insulation

R_pre = R-Value of the existing insulation

R_post =R-Value of the new installed insulation

Gross kWh = Stories × SQFT × (CFM/SQFT_pre - CFM/SQFT_post) × deltakWh/CFM

kW/kWh = Average annual kW reduction per kWh reduction

Hours: 4,644.0.

Hours Source: NOAA Weather data: An average BASE 60 Annual Heating Degree Day value for weather stations in Rhode Island and southeastern Massachusetts based on NOAA 30-year data.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
INSULATION OIL	Calc	Calc	0.00	0.00	0.00	Calc	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Oil MMBtu Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
INSULATION OIL	25	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
INSULATION OIL	6.59%	3.85%	47.32%	42.24%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
INSULATION OIL	0.00	0.00	368.88	0

Annual $ Source: NMR Group, Inc (2021). TXC50 Low Income Multifamily NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
INSULATION OIL	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Participant (NEB)

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Participant | **Measure Type:** NEI | **Measure Sub Type:** Low Income

Program: B03b Low Income Retrofit Multifamily

Measure Description

This row identifies a participant for tracking and cost purposes.

Baseline Description

N/A

Savings Principle

N/A

Savings Method

N/A

Unit

N/A

Savings Equation

N/A

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Participant (NEB)	0	0	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Participant (NEB)	11	1.00	1.00		0.86	1.00	1.00	0.58	0.86

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Participant (NEB)	32.24%	34.78%	15.36%	17.62%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Participant (NEB)	0.00	0.00	7.70	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Participant (NEB)	0.00	0.00	0.00	1.00

TRC: $758.00 / participant

Incentive: $758.00 / participant

Pipe Wrap DHW Elec

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Insulation | **Measure Sub Type:** Pipe Insulation

Program: B03b Low Income Retrofit Multifamily

Measure Description

Installation of insulation to reduce water heating energy.

Baseline Description

The baseline case is uninsulated heated water pipes.

Savings Principle

The high efficiency case is the installation of high-efficiency domestic hot water equipment such as low-flow showerheads and faucet aerators.

Savings Method

Deemed

Unit

Linear Foot

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Pipe Wrap DHW Elec	38.0	0.0060	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Electric kW Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Pipe Wrap DHW Elec	15	0.90	1.00		1.00	1.00	1.00	0.31	0.81

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Pipe Wrap DHW Elec	41.52%	31.39%	15.22%	11.88%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

Measure Life Note: Massachusetts Common Assumption

ISR Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRsp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRwp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Pipe Wrap DHW Elec	0.00	0.00	6.61	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Pipe Wrap DHW Elec	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Pipe Wrap DHW Oil

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Insulation | **Measure Sub Type:** Pipe Insulation

Program: B03b Low Income Retrofit Multifamily

Measure Description

Installation of insulation to reduce water heating energy.

Baseline Description

The baseline case is uninsulated heated water pipes.

Savings Principle

The high efficiency case is the installation of high-efficiency domestic hot water equipment such as low-flow showerheads and faucet aerators.

Savings Method

Deemed

Unit

Linear Foot

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Pipe Wrap DHW Oil	0	0	0.00	0.00	0.00	0.15	0.00

Oil MMBtu Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Pipe Wrap DHW Oil	15	0.90	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Pipe Wrap DHW Oil	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

Measure Life Note: Massachusetts Common Assumption

ISR Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

CFwp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Pipe Wrap DHW Oil	0.00	0.00	6.61	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Pipe Wrap DHW Oil	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Pipe Wrap Heating Oil

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: HVAC | **Measure Type:** Insulation | **Measure Sub Type:** Pipe Insulation

Program: B03b Low Income Retrofit Multifamily

Measure Description

Installation of insulation to reduce water heating energy.

Baseline Description

The baseline case is uninsulated heated water pipes.

Savings Principle

The high efficiency case is the installation of high-efficiency domestic hot water equipment such as low-flow showerheads and faucet aerators.

Savings Method

Deemed

Unit

Linear Foot

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Pipe Wrap Heating Oil	0	0	0.00	0.00	0.00	0.16	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Pipe Wrap Heating Oil	15	1.00	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Pipe Wrap Heating Oil	0.00%	0.00%	0.00%	0.00%

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

CFwp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Pipe Wrap Heating Oil	0.00	0.00	6.61	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Pipe Wrap Heating Oil	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Refrigerator

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Appliances | **Measure Type:** Refrigerators | **Measure Sub Type:** Refrigerator

Program: B03b Low Income Retrofit Multifamily

Measure Description

This measure covers the replacement of an existing inefficient refrigerator with a new ENERGY STAR® rated refrigerator. ENERGY STAR® qualified refrigerators use at least 20% less energy than non-qualified models.

Baseline Description

The baseline efficiency case is the existing refrigerator. It is assumed that low-income customers would otherwise replace their refrigerators with a used inefficient unit.

Savings Principle

The high efficiency case is an ENERGY STAR® rated refrigerator that meets the ENERGY STAR® criteria for full-sized refrigerators (7.75 cubic feet), using at least 20% less energy than models meeting the minimum Federal government standard.

Savings Method

Calculated using deemed inputs

Unit

Installed high-efficiency refrigerator.

Savings Equation

delta kWh = ((kWhpre-kWhes) x (RUL/EUL)) + (((kWhstd+kWhused)/2 - kWhes) x ((EUL-RUL)/EUL)) x Focc

Where:

kWhpre = Annual kWh consumption of existing equipment. Value is based on metering or AHAM database. The default value is 874 kWh.

kWhES = Annual kWhconsumption of new ENERGY STAR qualified refrigerator or freezer. This is from the nameplate on the new unit. The default value is 358 kWh.

STD Average annual consumption of equipment meeting federal standard: Calculated by dividing the kWhES by 0.9 (i.e., the Energy Star units are assumed to be 10% more efficient than the kWhstd units). The default value is

398 kWh.

kWhused Average annual consumption of used equipment. Default value is 475 kWh.34

RUL = Remaining Useful life assumed to be 6 years

EUL = Estimated useful life for a new refrigerator is 12 years35

Focc = Occupant adjustment factor used to adjust the energy savings according to the number of occupants in the dwelling unit. See table below. Default is 2.3 occupants per tenant unit

ΔkWh = 330, using the default assumptions

Hours: 8,760.0.

Hours Note: The average annual operating hours are 8760 hours/year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Refrigerator	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Refrigerator	12	1.00	1.00		1.00	1.00	1.00	0.79	0.65

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Refrigerator	29.00%	31.95%	18.18%	20.87%

Measure Life Source: Environmental Protection Agency (2009). Life Cycle Cost Estimate for ENERGY STAR Qualified Residential Refrigerator.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rates are 100% since savings estimates are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Refrigerator	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Refrigerator	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

SHOWERHEAD Elec

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: B03b Low Income Retrofit Multifamily

Measure Description

Installation of a low flow showerhead with a flow rate of 1.5 GPM or less.

Baseline Description

The baseline efficiency case is a showerhead with a flow of 2.5 gpm. For home audit applications, the baseline is the existing showerhead.

Savings Principle

The high efficiency is a low-flow showerhead with a flow of 1.5 gpm or less.

Savings Method

Deemed

Unit

Installed showerhead.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
SHOWERHEAD Elec	246.0	0.0590	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Electric kW Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
SHOWERHEAD Elec	15	0.90	1.00		1.00	1.00	1.00	0.31	0.81

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
SHOWERHEAD Elec	41.52%	31.39%	15.22%	11.88%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

Measure Life Note: National Grid assumption based on regional PA working groups.

ISR Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRsp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRwp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
SHOWERHEAD Elec	1786.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
SHOWERHEAD Elec	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

SHOWERHEAD Oil

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: B03b Low Income Retrofit Multifamily

Measure Description

Installation of a low flow showerhead with a flow rate of 1.5 GPM or less.

Baseline Description

The baseline efficiency case is a showerhead with a flow of 2.5 gpm. For home audit applications, the baseline is the existing showerhead.

Savings Principle

The high efficiency is a low-flow showerhead with a flow of 1.5 gpm or less.

Savings Method

Deemed

Unit

Installed showerhead.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
SHOWERHEAD Oil	0	0	0.00	0.00	0.00	1.40	0.00

Oil MMBtu Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
SHOWERHEAD Oil	15	0.90	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
SHOWERHEAD Oil	0.00%	0.00%	0.00%	0.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

Measure Life Note: National Grid assumption based on regional PA working groups.

ISR Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

CFwp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
SHOWERHEAD Oil	1786.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
SHOWERHEAD Oil	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Smart Strips

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Plug Load | **Measure Type:** Smart Strips | **Measure Sub Type:** Smart Strip

Program: B03b Low Income Retrofit Multifamily

Measure Description

The basic measures switches off plug load using current sensors and switching devices which turn off plug load when electrical current drops below threshold low levels. The advanced measure shuts devices off after it no longer senses activity from their infrared controls.

Baseline Description

The baseline efficiency case is the absence power strip and leaving peripheral devices plugged in or using a power surge protector and leaving peripheral devices on.

Savings Principle

The high efficiency case is the use of a smart strip or advanced smart strip.

Savings Method

Deemed

Unit

Rebated smart strip.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: 8,760.0.

Hours Note: Since the power strip is assumed to be plugged in all year, the savings are based on 8,760 operational hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Smart Strips	105.0	0.0189	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: NMR Group, Inc. (2019). Advanced Power Strip Metering Study- Revised

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Smart Strips	6	0.84	1.00		0.92	0.92	0.92	0.58	0.86

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Smart Strips	32.24%	34.78%	15.36%	17.62%

Measure Life Source: Nexus Market Research and RLW Analytics (2008). Residential Lighting Measure Life Study. Prepared for New England Residential Lighting Program Sponsors.

ISR Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: NMR Group, Inc. (2019). Advanced Power Strip Metering Study- Revised

RRsp Source: NMR Group, Inc. (2019). Advanced Power Strip Metering Study- Revised

RRwp Source: NMR Group, Inc. (2019). Advanced Power Strip Metering Study- Revised

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Smart Strips	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Smart Strips	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Standalone WH Oil

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Water Heating | **Measure Type:** Water Heater | **Measure Sub Type:** Water Heater

Program: B03b Low Income Retrofit Multifamily

Measure Description

Installation of high efficiency water heating system.

Baseline Description

The baseline is the existing water heating system.

Savings Principle

The high efficiency case includes replacing water heating systems with higher efficiency systems.

Savings Method

Calculated using site-specific inputs

Unit

Water Heating System

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Standalone WH Oil	Calc	Calc	0.00	0.00	0.00	Calc	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Standalone WH Oil	13	1.00	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Standalone WH Oil	0.00%	0.00%	0.00%	0.00%

Measure Life Source: DOE (2008). ENERGY STAR® Residential Water Heaters: Final Criteria Analysis. Prepared for the DOE; Page 10.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

CFwp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Standalone WH Oil	0.00	0.00	1.19	0

Annual $ Source: NMR (2018, 2019). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). TXC50 - LIMF Market Rate MF NEI - Phase I.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Standalone WH Oil	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Standalone WH Other

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Water Heating | **Measure Type:** Water Heater | **Measure Sub Type:** Water Heater

Program: B03b Low Income Retrofit Multifamily

Measure Description

Installation of high efficiency water heating system.

Baseline Description

The baseline is the existing water heating system.

Savings Principle

The high efficiency case includes replacing water heating systems with higher efficiency systems.

Savings Method

Calculated using site-specific inputs

Unit

Water Heating System

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Standalone WH Other	Calc	Calc	0.00	0.00	0.00	Calc	Calc

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Standalone WH Other	13	1.00	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Standalone WH Other	0.00%	0.00%	0.00%	0.00%

Measure Life Source: DOE (2008). ENERGY STAR® Residential Water Heaters: Final Criteria Analysis. Prepared for the DOE; Page 10.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

CFwp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Standalone WH Other	0.00	0.00	1.19	0

Annual $ Source: NMR (2018, 2019). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). TXC50 - LIMF Market Rate MF NEI - Phase I.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Standalone WH Other	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Tankless WH Oil

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Water Heating | **Measure Type:** Water Heater | **Measure Sub Type:** Water Heater

Program: B03b Low Income Retrofit Multifamily

Measure Description

Installation of high efficiency water heating system.

Baseline Description

The baseline is the existing water heating system.

Savings Principle

The high efficiency case includes replacing water heating systems with higher efficiency systems.

Savings Method

Calculated using site-specific inputs

Unit

Water Heating System

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Tankless WH Oil	Calc	Calc	0.00	0.00	0.00	Calc	0.00

Electric kWh Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Electric kW Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Tankless WH Oil	20	1.00	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Tankless WH Oil	0.00%	0.00%	0.00%	0.00%

Measure Life Source: DOE (2008). ENERGY STAR® Residential Water Heaters: Final Criteria Analysis. Prepared for the DOE; Page 10.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

CFsp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

CFwp Source: Cadmus Demand Impact Model (2012). Estimated using the demand allocation methodology, Prepared for the Massachusetts Program Administrators.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Tankless WH Oil	0.00	0.00	1.19	0

Annual $ Source: NMR (2018, 2019). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). TXC50 - LIMF Market Rate MF NEI - Phase I.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Tankless WH Oil	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

THERMOSTAT AC Only

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: B03b Low Income Retrofit Multifamily

Measure Description

Installation of programmable thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule to meet occupancy needs and minimize redundant HVAC operation.

Baseline Description

The baseline efficiency case is an HVAC system providing space heating without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system providing space heating with a programmable thermostat installed.

Savings Method

Deemed

Unit

Installed thermostat

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
THERMOSTAT AC Only	15.0	0.0110	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Electric kW Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
THERMOSTAT AC Only	19	0.95	1.00		1.00	1.00	1.00	0.00	0.43

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
THERMOSTAT AC Only	43.13%	56.87%	0.00%	0.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRsp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRwp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
THERMOSTAT AC Only	0.00	0.00	16.02	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
THERMOSTAT AC Only	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

THERMOSTAT Elec with AC

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: B03b Low Income Retrofit Multifamily

Measure Description

Installation of programmable thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule to meet occupancy needs and minimize redundant HVAC operation.

Baseline Description

The baseline efficiency case is an HVAC system providing space heating without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system providing space heating with a programmable thermostat installed.

Savings Method

Deemed

Unit

Installed thermostat

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
THERMOSTAT Elec with AC	278.0	0.2363	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Electric kW Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
THERMOSTAT Elec with AC	19	0.95	1.00		1.00	1.00	1.00	0.33	0.22

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
THERMOSTAT Elec with AC	25.42%	30.57%	22.44%	21.58%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRsp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRwp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
THERMOSTAT Elec with AC	0.00	0.00	16.02	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
THERMOSTAT Elec with AC	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

THERMOSTAT Heat Pump

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: B03b Low Income Retrofit Multifamily

Measure Description

Installation of programmable thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule to meet occupancy needs and minimize redundant HVAC operation.

Baseline Description

The baseline efficiency case is an HVAC system providing space heating without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system providing space heating with a programmable thermostat installed.

Savings Method

Deemed

Unit

Installed thermostat

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
THERMOSTAT Heat Pump	278.0	0.2363	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Electric kW Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
THERMOSTAT Heat Pump	19	0.95	1.00		1.00	1.00	1.00	0.33	0.22

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
THERMOSTAT Heat Pump	25.42%	30.57%	22.44%	21.58%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRsp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRwp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
THERMOSTAT Heat Pump	0.00	0.00	16.02	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
THERMOSTAT Heat Pump	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

THERMOSTAT OIL

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: B03b Low Income Retrofit Multifamily

Measure Description

Installation of programmable thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule to meet occupancy needs and minimize redundant HVAC operation.

Baseline Description

The baseline efficiency case is an HVAC system providing space heating without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system providing space heating with a programmable thermostat installed.

Savings Method

Deemed

Unit

Installed thermostat

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
THERMOSTAT OIL	29.0	0.0247	0.00	0.00	0.00	1.60	0.00

Electric kWh Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Electric kW Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Oil MMBtu Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
THERMOSTAT OIL	19	0.95	1.00		1.00	1.00	1.00	0.33	0.22

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
THERMOSTAT OIL	25.42%	30.57%	22.44%	21.58%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRsp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRwp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
THERMOSTAT OIL	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
THERMOSTAT OIL	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

TSV Showerhead Elec

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: B03b Low Income Retrofit Multifamily

Measure Description

A showerhead with a control that limits flow once water is heated.

Baseline Description

The baseline efficiency case is a showerhead with a flow of 2.5 gpm. For home audit applications, the baseline is the existing showerhead.

Savings Principle

The high efficiency is a low-flow showerhead with a control that limits flow once the water is heated.

Savings Method

Deemed

Unit

Installed showerhead.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
TSV Showerhead Elec	315.0	0.0756	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Electric kW Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
TSV Showerhead Elec	15	0.90	1.00		1.00	1.00	1.00	0.31	0.81

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
TSV Showerhead Elec	41.52%	31.39%	15.22%	11.88%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRsp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRwp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
TSV Showerhead Elec	2254.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
TSV Showerhead Elec	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Vending Miser

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Vending Miser | **Measure Type:** Vending Miser | **Measure Sub Type:** Vending Miser

Program: B03b Low Income Retrofit Multifamily

Measure Description

Controls significantly reduce the energy consumption of refrigerated beverage vending machine lighting and refrigeration systems by powering down these systems during periods of inactivity while maintaining a refrigerated product. This measure applies torefrigerated beverage vending machines and glass front refrigerated coolers. This measure does not apply to ENERGY STAR® qualified vending machines, as they already have built-in controls.

Baseline Description

The baseline efficiency case is a standard efficiency refrigerated beverage vending machine, or glass front refrigerated cooler without a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Savings Principle

The high efficiency case is a standard efficiency refrigerated beverage vending machine, or glass front refrigerated cooler with a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Savings Method

Deemed

Unit

Installed vending miser.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: 8,760.0.

Hours Note: It is assumed that the connected equipment operates 24 hours per day, 7 days per week for a total annual operating hours of 8,760.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Vending Miser	1,612.0	0.0000	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: USA Technologies Energy Management Product Sheets (2006). Accessed on 09/01/2009.

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Vending Miser	5	1.00	1.00		1.00	1.00	1.00	0.90	0.90

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Vending Miser	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRsp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

RRwp Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Vending Miser	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Vending Miser	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Window - Electric Resistance

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, electric resistance

Program: B03b Low Income Retrofit Multifamily

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Window - Electric Resistance	254.0	0.1300	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Window - Electric Resistance	25	1.00	1.00		1.00	1.00	1.00	0.33	0.43

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Window - Electric Resistance	45.00%	44.00%	6.00%	5.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Window - Electric Resistance	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Window - Electric Resistance	0.00	0.00	0.00	1.00

NTG Source: MA 2022 TRM

TRC: $700.00 / measure

Incentive: $700.00 / measure

Window - Heat Pump

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, heat pump

Program: B03b Low Income Retrofit Multifamily

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Window - Heat Pump	127.0	0.0900	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Window - Heat Pump	25	1.00	1.00		1.00	1.00	1.00	0.37	0.22

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Window - Heat Pump	26.00%	29.00%	24.00%	21.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Window - Heat Pump	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Window - Heat Pump	0.00	0.00	0.00	1.00

NTG Source: MA 2022 TRM

TRC: $700.00 / measure

Incentive: $700.00 / measure

Window - Oil

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, oil

Program: B03b Low Income Retrofit Multifamily

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Window - Oil	7.0	0.0100	1.27	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Gas Heat MMBtu Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Window - Oil	25	1.00	1.00		1.00	1.00	1.00	0.37	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Window - Oil	49.80%	42.60%	3.60%	4.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Window - Oil	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Window - Oil	0.00	0.00	0.00	1.00

NTG Source: MA 2022 TRM

TRC: $700.00 / measure

Incentive: $700.00 / measure

Window - Propane

Sector: Income Eligible | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, propane

Program: B03b Low Income Retrofit Multifamily

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Window - Propane	7.0	0.0100	1.27	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Gas Heat MMBtu Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Window - Propane	25	1.00	1.00		1.00	1.00	1.00	0.37	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Window - Propane	49.80%	42.60%	3.60%	4.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Window - Propane	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Window - Propane	0.00	0.00	0.00	1.00

NTG Source: MA 2022 TRM

TRC: $700.00 / measure

Incentive: $700.00 / measure

Participants

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Participant | **Measure Type:** Participant | **Measure Sub Type:** Participant

Program: B03a Low Income Retrofit 1-4

Measure Description

This row identifies a participant for tracking and cost purposes.

Baseline Description

N/A

Savings Principle

N/A

Savings Method

N/A

Unit

N/A

Savings Equation

N/A

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Participants	0	0	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Participants	5	1.00	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Participants	0.00%	0.00%	0.00%	0.00%

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Participants	0.00	0.00	7.70	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per participant / treated unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Participants	0.00	0.00	0.00	1.00

Programmable Thermostat, Gas

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Theromstat

Program: B03a Low Income Retrofit 1-4

Measure Description

Installation of a programmable thermostat which gives the ability to adjust heating or air-conditioning operating times according to a pre-set schedule.

Baseline Description

The baseline efficiency case is an HVAC system without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system that has a programmable thermostat installed.

Savings Method

Deemed

Unit

Installation of programmable thermostat

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Programmable Thermostat, Gas	27.0	0.0400	2.07	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Gas Heat MMBtu Source: MA Smart Thermostat Impact Study (RES 24) - Final Results

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Programmable Thermostat, Gas	19	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Programmable Thermostat, Gas	7.00%	4.00%	47.00%	42.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Programmable Thermostat, Gas	0.00	0.00	44.53	0

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Programmable Thermostat, Gas	0.00	0.00	0.00	1.00

Triple Pane Windows

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, triple pane

Program: B03a Low Income Retrofit 1-4

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Triple Pane Windows	7.0	0.0100	1.27	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Gas Heat MMBtu Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Triple Pane Windows	25	1.00	1.00		1.00	1.00	1.00	0.37	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Triple Pane Windows	4.00%	4.00%	49.50%	43.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Triple Pane Windows	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Triple Pane Windows	0.00	0.00	0.00	1.00

NTG Source: MA 2022 TRM

Weatherization

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Insulation & Air sealing | **Measure Sub Type:** Weatherization

Program: B03a Low Income Retrofit 1-4

Measure Description

Installation of weatherization measures such as air sealing and insulation in gas heated homes. Electric savings are achieved from reduced run time of the HVAC system fan(s).

Baseline Description

The baseline efficiency case is the existing home shell.

Savings Principle

The high efficiency case can be a combination of increased insulation, air sealing, duct sealing, and other improvements to the home shell.

Savings Method

Deemed

Unit

Household with weatherization measures installed

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Weatherization	93.0	0.0700	12.40	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Gas Heat MMBtu Source: Cadeo (2018). Rhode Island Income Eligible Services Single Family Impact Evaluation

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Weatherization	20	1.00	1.00		1.00	1.00	1.00	0.34	0.21

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Weatherization	25.00%	30.00%	23.00%	22.00%

Measure Life Source: Environmental Protection Agency (2009). Life Cycle Cost Estimate for ENERGY STAR Qualified Boiler.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Weatherization	0.00	0.00	558.21	0

Annual $ Source: Massachusetts Special and Cross-Cutting Research Area: Low-Income Single-Family Health- and Safety-Related Non-Energy Impacts (NEIs) Study, August 5, 2016. Prepared by: Three3, Inc. and NMR Group

NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per participant / treated unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Weatherization	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $5,500.00 / job

Incentive: $5,500.00 / job

Wi-Fi Thermostat, Gas

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** WiFi T-stat

Program: B03a Low Income Retrofit 1-4

Measure Description

A communicating thermostat which allows remote set point adjustment and control via remote application. System requires an outdoor air temperature algorithm in the control logic to operate heating and cooling systems Primary Energy Impact: Natural Gas.

Baseline Description

The baseline efficiency case is an HVAC system without a wifi thermostat.

Savings Principle

The high efficiency case is an HVAC system that has a wifi thermostat installed.

Savings Method

Deemed

Unit

Installation of WiFi programmable thermostat

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Wi-Fi Thermostat, Gas	20.0	0.0300	2.79	0.00	0.00	0.00	0.00

Electric kWh Source: Cadeo/Illume (2020). 2017-2018 Impact Evaluation of EnergyWise Single Family Program

Electric kW Source: Navigant Consulting (2018). Baseline Loadshape Study

Gas Heat MMBtu Source: MA Smart Thermostat Impact Study (RES 24) - Final Results

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Wi-Fi Thermostat, Gas	15	1.00	1.00		1.00	1.00	1.00	0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Wi-Fi Thermostat, Gas	7.00%	4.00%	47.00%	42.00%

Measure Life Source: Environmental Protection Agency (2010). Life Cycle Cost Estimate for Programmable Thermostats. Accessed on 10/12/2011.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Wi-Fi Thermostat, Gas	0.00	0.00	44.53	0

Annual $ Note: NEI per unit

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Wi-Fi Thermostat, Gas	0.00	0.00	0.00	1.00

Air Sealing

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Building Shell | **Measure Type:** Air Sealing | **Measure Sub Type:** Air Sealing/Infiltration

Program: Low Income Multifamily

Measure Description

Thermal shell air leaks are sealed through strategic use and location of air-tight materials.

Baseline Description

The baseline efficiency case is the existing building before the air sealing measure is implemented. The baseline building is characterized by the existing CFM50 measurement (CFM50PRE) for single family homes, or the existing air changes per hour (ACHPRE)

Savings Principle

The high efficiency case is the existing building after the air sealing measure is implemented. The high efficiency building is characterized by the new CFM50 measurement for single family homes (CFM50POST), or the new air changes per hour (ACHPOST) for multi-family facilities, which is measured after the air sealing measure is implemented.

Savings Method

Calculated using site-specific inputs

Unit

Completed air sealing project.

Savings Equation

Gross MMBtu Gas = (CFM50_pre - CFM50_post) / LBL × HDD × (Hours per Day) × (Minutes per Hour) × (Btu/ft3-°F) × CorrectionFactor / SeasonalEff / (Btu per MMBtu)

Where:

CFM50_pre = CFM50 measurement before air sealing

CFM50_post = CFM50 measurement after air sealing (cu.ft./min)

LBL = LBL factor - This factor is determined as the product of the N-factor and a Height Correction Factor according to BPI Protocol

4644 HDD = Heating degree days (deg. F-day); This value is an average BASE 60 Annual Heating Degree Day value for weather stations in Rhode Island and southeastern Massachusetts based on NOAA 30-year data. http://www.ncdc.noaa.gov

24 Hours per Day = Conversion factor

60 Minutes per Hour = Conversion factor

0.018 Btu/ft3-°F = Heat capacity of 1 cubic foot of air at 70 °F

1 CorrectionFactor = Correction factor determined by auditor (e.g. for seasonal homes): Default

0.7 SeasonalEff = Heating system seasonal efficiency factor determined by auditor for homes heated with natural gas: Default

1,000,000 Btuper MMBtu = Conversion factor

Hours: 4,644.0.

Hours Source: NOAA Weather data: An average BASE 60 Annual Heating Degree Day value for weather stations in Rhode Island and southeastern Massachusetts based on NOAA 30-year data.

Hours Note: Heating hours are characterized by the heating degree days for the facility, 4644.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Air Sealing	0	0.0000	Calc	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Air Sealing	20	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Air Sealing	0.00%	0.00%	0.00%	0.00%

Measure Life Source: 'ComEd Effective Useful Life Research Report', May 2018

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Air Sealing	0.00	0.00	368.88	0

Annual $ Source: NMR Group, Inc (2021). TXC50 Low Income Multifamily NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Air Sealing	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Custom

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Custom | **Measure Sub Type:** Custom

Program: Low Income Multifamily

Measure Description

Vendors install a variety of measures at multifamily facilities. Includes custom non-lighting measures.

Baseline Description

For retrofit projects, the baseline efficiency case is the same as the existing, or pre-retrofit, case for the custom non-lighting measures.

Savings Principle

The high efficiency scenario is specific to the facility and may include one or more energy efficiency custom non-lighting measures.

Savings Method

Calc

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Custom	0	Calc	Calc	Calc	Calc	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Custom	15	1.00	1.00	0.99	0.99			Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Custom	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Custom	0.00	0.00	799.24	0

Annual $ Source: NMR Group, Inc (2021). TXC50 Low Income Multifamily NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Custom	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Demand Circulator

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Demand Circulator

Program: Low Income Multifamily

Measure Description

Installation of a demand controller on a re-circulation loop.

Baseline Description

Full time operation of re-circ pump.

Savings Principle

The re-circulation pump is controlled by a demand signal or timer to reduce operating hours when no hot water usage occurs.

Savings Method

Calc

Unit

Installed recirculation controller

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Demand Circulator	0	0	Calc	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Demand Circulator	15	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Demand Circulator	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Demand Circulator	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Demand Circulator	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Duct Sealing

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Custom

Measure Category: HVAC | **Measure Type:** Ducting | **Measure Sub Type:** Duct Sealing

Program: Low Income Multifamily

Measure Description

Ducts are sealed by reconnecting disconnected duct joints and sealing gaps or seams with mastic and fiber-mesh tape as appropriate.

Baseline Description

The baseline efficiency case is the existing facility or equipment prior to the implementation of duct sealing.

Savings Principle

The baseline efficiency case is the existing facility or equipment after the implementation of duct sealing.

Savings Method

Calc

Unit

Installation of duct sealing

Savings Equation

MMBtu = Annualheatingconsumption x %SAVE x (1/1000000)

Where:

AnnualHeatingConsumption = The total annual heating consumption for the facility (Btu)

%SAVE = Average reduction in energy consumption.

1/1,000,000 = Conversion from Btu to MMBtu

Savings Factors for Multifamily Duct Sealing

Measure Type %SAVE158

Savings Factors for Multifamily Duct Sealing

Surface Area < 50 SQFT 7%

Surface Area > 50 SQFT and < 200 SQFT 3%

Surface Area > 200 SQFT 1%

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Duct Sealing	0	0	Calc	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Duct Sealing	20	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Duct Sealing	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Duct Sealing	0.00	0.00	1.04	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Duct Sealing	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Faucet Aerator

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Faucet Aerator

Program: Low Income Multifamily

Measure Description

Installation of a faucet aerator with a flow rate of 1.5 GPM or less on an existing faucet with high flow.

Baseline Description

The baseline efficiency case is an existing faucet with a high flow.

Savings Principle

The high efficiency is a low-flow faucet aerator.

Savings Method

Deemed

Unit

Installed faucet aerator.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Faucet Aerator	0	0	0.00	0.20	0.00	0.00	0.00

Gas DHW MMBtu Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Faucet Aerator	7	0.90	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Faucet Aerator	0.00%	0.00%	0.00%	0.00%

Measure Life Source: The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for the Massachusetts Program Administrators.

ISR Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Faucet Aerator	359.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Faucet Aerator	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Heating System Retrofit, Boiler

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Custom

Measure Category: HVAC | **Measure Type:** Heating System | **Measure Sub Type:** Retrofit Boiler

Program: Low Income Multifamily

Measure Description

Installation of high efficiency heating equipment to replace the existing inefficient furnace, hydronic boiler or steam boiler.

Baseline Description

The baseline efficiency is determined based on the type of heating equipment installed. For boilers it is 75% AFUE and for furnaces it is 78% AFUE..

Savings Principle

The high efficiency case is characterized by the rated efficiency (AFUEEE) of the new high efficiency furnace or boiler.

Savings Method

Calc

Unit

Heating system

Savings Equation

Delta MMBtu = (Btu/hr) x ((1/AFUEbase)-(1/AFUEee)) X EFLHheat x (1/1000000)

Where:

Btu/hr = Nominal heating capacity of the installed equipment (Btu/hr)

AFUEBASE = Average fuel utilization efficiency of the existing equipment (%)

AFUEEE = Average fuel utilization efficiency of the efficient equipment (%)

EFLHHeat = Equivalent full load heating hours for the facility (Hr)

1/1,000,000 = Conversion from Btu to MMBtu

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heating System Retrofit, Boiler	0	0	Calc	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heating System Retrofit, Boiler	23	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heating System Retrofit, Boiler	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heating System Retrofit, Boiler	0.00	0.00	799.24	0

Annual $ Source: NMR Group, Inc (2021). TXC50 Low Income Multifamily NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heating System Retrofit, Boiler	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Heating System Retrofit, Commercial Boiler

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Custom

Measure Category: HVAC | **Measure Type:** Heating System | **Measure Sub Type:** Retrofit Boiler

Program: Low Income Multifamily

Measure Description

Installation of high efficiency heating equipment to replace the existing inefficient furnace, hydronic boiler or steam boiler.

Baseline Description

The baseline efficiency is determined based on the type of heating equipment installed. For boilers it is 75% AFUE and for furnaces it is 78% AFUE.

Savings Principle

The high efficiency case is characterized by the rated efficiency (AFUEEE) of the new high efficiency furnace or boiler.

Savings Method

Calc

Unit

Heating system

Savings Equation

Delta MMBtu = (Btu/hr) x ((1/AFUEbase)-(1/AFUEee)) X EFLHheat x (1/1000000)

Where:

Btu/hr = Nominal heating capacity of the installed equipment (Btu/hr)

AFUEBASE = Average fuel utilization efficiency of the existing equipment (%)

AFUEEE = Average fuel utilization efficiency of the efficient equipment (%)

EFLHHeat = Equivalent full load heating hours for the facility (Hr)

1/1,000,000 = Conversion from Btu to MMBtu

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heating System Retrofit, Commercial Boiler	0	0	Calc	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heating System Retrofit, Commercial Boiler	25	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heating System Retrofit, Commercial Boiler	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heating System Retrofit, Commercial Boiler	0.00	0.00	799.24	0

Annual $ Source: NMR Group, Inc (2021). TXC50 Low Income Multifamily NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heating System Retrofit, Commercial Boiler	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Heating System Retrofit, Furnace

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Custom

Measure Category: HVAC | **Measure Type:** Heating System | **Measure Sub Type:** Retrofit Furnace

Program: Low Income Multifamily

Measure Description

Installation of high efficiency heating equipment to replace the existing inefficient furnace, hydronic boiler or steam boiler.

Baseline Description

The baseline efficiency is determined based on the type of heating equipment installed. For boilers it is 75% AFUE and for furnaces it is 78% AFUE.

Savings Principle

The high efficiency case is characterized by the rated efficiency (AFUEEE) of the new high efficiency furnace or boiler.

Savings Method

Calc

Unit

Installation of new high efficiency furnace or boiler.

Savings Equation

Delta MMBtu = (Btu/hr) x ((1/AFUEbase)-(1/AFUEee)) X EFLHheat x (1/1000000)

Where:

Btu/hr = Nominal heating capacity of the installed equipment (Btu/hr)

AFUEBASE = Average fuel utilization efficiency of the existing equipment (%)

AFUEEE = Average fuel utilization efficiency of the efficient equipment (%)

EFLHHeat = Equivalent full load heating hours for the facility (Hr)

1/1,000,000 = Conversion from Btu to MMBtu

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heating System Retrofit, Furnace	0	0	Calc	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heating System Retrofit, Furnace	17	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heating System Retrofit, Furnace	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heating System Retrofit, Furnace	0.00	0.00	799.24	0

Annual $ Source: NMR Group, Inc (2021). TXC50 Low Income Multifamily NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heating System Retrofit, Furnace	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Low-Flow Showerhead

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: Low Income Multifamily

Measure Description

Installation of a low flow showerhead with a flow rate of 1.5 GPM or less.

Baseline Description

The baseline efficiency case is a showerhead with a flow of 2.5 gpm. For home audit applications, the baseline is the existing showerhead.

Savings Principle

The high efficiency is a low-flow showerhead with a flow of 1.5 gpm or less.

Savings Method

Deemed

Unit

Installed low-flow showerhead

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low-Flow Showerhead	0	0	0.00	1.30	0.00	0.00	0.00

Gas DHW MMBtu Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low-Flow Showerhead	15	0.90	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low-Flow Showerhead	0.00%	0.00%	0.00%	0.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low-Flow Showerhead	1786.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low-Flow Showerhead	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Low-Flow Showerhead with Thermo Control (Ladybug gas DHW)

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: Low Income Multifamily

Measure Description

A showerhead with a control that limits flow once water is heated.

Baseline Description

The baseline case is a showerhead with a flow of 2.5 gallons per minute, or for the case of the adapter, a low flow showerhead with flow of 1.5 gpm or less.

Savings Principle

The high efficiency is a low-flow showerhead with a control that limits flow once the water is heated.

Savings Method

Deemed

Unit

Installed low-flow showerhead

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low-Flow Showerhead with Thermo Control (Ladybug gas DHW)	0	0	0.00	0.34	0.00	0.00	0.00

Gas DHW MMBtu Source: National Grid (2014). Review of ShowerStart evolve.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low-Flow Showerhead with Thermo Control (Ladybug gas DHW)	15	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low-Flow Showerhead with Thermo Control (Ladybug gas DHW)	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: National Grid assumption based on regional PA working groups.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low-Flow Showerhead with Thermo Control (Ladybug gas DHW)	558.00	0.00	0	0

Water/Sewer Source: National Grid (2014). Review of ShowerStart evolve.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low-Flow Showerhead with Thermo Control (Ladybug gas DHW)	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Low-Flow Showerhead with Thermo Control (Roadrunner Gas DHW)

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: Low Income Multifamily

Measure Description

A showerhead with a control that limits flow once water is heated.

Baseline Description

The baseline case is a showerhead with a flow of 2.5 gallons per minute, or for the case of the adapter, a low flow showerhead with flow of 1.5 gpm or less.

Savings Principle

The high efficiency is a low-flow showerhead with a control that limits flow once the water is heated.

Savings Method

Deemed

Unit

Installed low-flow showerhead

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low-Flow Showerhead with Thermo Control (Roadrunner Gas DHW)	0	0	0.00	1.60	0.00	0.00	0.00

Gas DHW MMBtu Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low-Flow Showerhead with Thermo Control (Roadrunner Gas DHW)	15	0.90	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low-Flow Showerhead with Thermo Control (Roadrunner Gas DHW)	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: National Grid assumption based on regional PA working groups.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low-Flow Showerhead with Thermo Control (Roadrunner Gas DHW)	2254.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low-Flow Showerhead with Thermo Control (Roadrunner Gas DHW)	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Participant

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Participant | **Measure Type:** Participant | **Measure Sub Type:** Participant

Program: Low Income Multifamily

Measure Description

This row identifies a participant for tracking and cost purposes.

Baseline Description

Savings Principle

Savings Method

Unit

Per participant

Savings Equation

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Participant	0	0	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Participant	1	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Participant	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Participant	0.00	0.00	7.70	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Participant	0.00	0.00	0.00	1.00

TRC: $707.00 / participant

Incentive: $707.00 / participant

Pipe Wrap (Water Heating)

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Insulation | **Measure Sub Type:** Pipe Insulation

Program: Low Income Multifamily

Measure Description

Installation of DHW pipe wraps.

Baseline Description

The baseline efficiency case is the existing hot water equipment.

Savings Principle

The high efficiency case includes pipe wrap.

Savings Method

Deemed

Unit

Installation of a DHW pipe wrap

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Pipe Wrap (Water Heating)	0	0	0.00	0.15	0.00	0.00	0.00

Gas DHW MMBtu Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Gas DHW MMBtu Note: 3 feet per piece

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Pipe Wrap (Water Heating)	15	0.90	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Pipe Wrap (Water Heating)	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Pipe Wrap (Water Heating)	0.00	0.00	6.61	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Pipe Wrap (Water Heating)	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Programmable Thermostat

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Custom

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: Low Income Multifamily

Measure Description

Installation of a programmable thermostat which gives the ability to adjust heating or air-conditioning operating times according to a pre-set schedule.

Baseline Description

For the installation of a programmable thermostat, the baseline efficiency case is an HVAC system using natural gas to provide space heating without a programmable thermostat. For the installation of a wi-fi programmable thermostat, the baseline efficiency case is an HVAC system using natural gas to provide space heating with a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system that has a programmable thermostat or wi-fi programmable thermostat installed.

Savings Method

Deemed

Unit

Installation of programmable thermostat

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Programmable Thermostat	29.0	0.0461	1.50	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Electric kW Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Gas Heat MMBtu Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Programmable Thermostat	19	0.95	1.00	1.00	1.00			0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Programmable Thermostat	6.59%	3.85%	47.32%	42.24%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Programmable Thermostat	0.00	0.00	13.35	0

Annual $ Source: NMR (2018, 2019). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). TXC50 - LIMF Market Rate MF NEI - Phase I.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Programmable Thermostat	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Shell Insulation

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Building Shell | **Measure Type:** Insulation | **Measure Sub Type:** Shell

Program: Low Income Multifamily

Measure Description

Insulation upgrades are applied in existing multifamily facilities.

Baseline Description

The baseline efficiency case is characterized by the total R-value of the existing attic, basement or sidewall (Rexisit). This is calculated as the R-value of the existing insulation, estimated by the program contractor, plus the R-value of the ceiling, floor, or wall (for all projects: RCEILING = 3.36; RFLOOR = 6.16; RWALL = 6.65)

Savings Principle

The high efficiency case is characterized by the total R-value of the attic after the installation of additional attic, basement or sidewall insulation. This is calculated as the sum of the existing R-value (RBASE) plus the R-value of the added insulation(RADD).

Savings Method

Calculated using site-specific inputs

Unit

Completed insulation project.

Savings Equation

MMBTUannual = (((1/Rexist)-(1/Rnew)) x HDD x 24 x Area) / (1,000,000) X Nheat

kWhannual = MMBtuannaul x 293.1

kW = kWhannual x kW/kWh heating

Where:

Rexist = Existing effective R-value (R-ExistingInsulation + R-Assembly), ft2-°F/Btuh

Rnew = New total effective R-value (R-ProposedMeasure + R-ExistingInsulation + R-Assembly), ft2-°F/Btuh

Area = Square footage of insulated area

ηheat = Efficiency of the heating system (AFUE or COP)

293.1 = Conversion constant (1MMBtu = 293.1 kWh)

24 = Conversion for hours per day

HDD = Heating Degree Days; dependent on location, see table below

1,000,000 = Conversion from Btu to MMBtu

kW/kWh heating = Average annual kW reduction per kWh reduction: 0.00050 kW/kWh

Hours: 4,644.0.

Hours Source: NOAA Weather data: An average BASE 60 Annual Heating Degree Day value for weather stations in Rhode Island and southeastern Massachusetts based on NOAA 30-year data.

Hours Note: Heating hours are characterized by the heating degree days for the facility, 4644.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Shell Insulation	0	0.0000	Calc	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Shell Insulation	25	1.00	1.00	1.00	1.00			0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Shell Insulation	6.59%	3.85%	47.32%	42.24%

Measure Life Source: The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for the Massachusetts Program Administrators.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Shell Insulation	0.00	0.00	368.88	0

Annual $ Source: NMR Group, Inc (2021). TXC50 Low Income Multifamily NEI Study

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Shell Insulation	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Triple Pane Windows

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Building Shell | **Measure Type:** Windows | **Measure Sub Type:** Windows, triple pane

Program: Low Income Multifamily

Measure Description

Early replacement of a single pane window either with or without a storm with a triple pane window.

Baseline Description

The baseline efficiency case is a single pane window with or without a storm.

Savings Principle

The high efficiency case is an Energy Star qualified triple pane window.

Savings Method

Deemed

Unit

Replacement of window with single pane either with or without a storm with a triple pane window.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Triple Pane Windows	7.0	0.0100	1.27	0.00	0.00	0.00	0.00

Electric kWh Source: MA 2022 TRM

Electric kW Source: MA 2022 TRM

Gas Heat MMBtu Source: MA 2022 TRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Triple Pane Windows	25	1.00	1.00		1.00	1.00	1.00	0.37	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Triple Pane Windows	4.00%	4.00%	49.50%	43.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Massachusetts Common Assumption

RRwp Note: Massachusetts Common Assumption

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Triple Pane Windows	0.00	0.00	6.72	0

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Triple Pane Windows	0.00	0.00	0.00	1.00

NTG Source: MA 2022 TRM

Wi-Fi Thermostat (Controls Gas Heat Only)

Sector: Income Eligible | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: Low Income Multifamily

Measure Description

A communicating thermostat which allows remote set point adjustment and control via remote application. System requires an outdoor air temperature algorithm in the control logic to operate heating and cooling systems Primary Energy Impact: Natural Gas.

Baseline Description

The baseline efficiency case is an HVAC system with either a manual or a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system that has a Wi-Fi thermostat installed.

Savings Method

Deemed

Unit

Installation of WiFi programmable thermostat

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Wi-Fi Thermostat (Controls Gas Heat Only)	31.0	0.0493	2.30	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Electric kW Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Gas Heat MMBtu Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Wi-Fi Thermostat (Controls Gas Heat Only)	15	0.95	1.00	1.00	1.00			0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Wi-Fi Thermostat (Controls Gas Heat Only)	6.59%	3.85%	47.32%	42.24%

Measure Life Source: Environmental Protection Agency (2010). Life Cycle Cost Estimate for Programmable Thermostats. Accessed on 10/12/2011.

ISR Source: RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Wi-Fi Thermostat (Controls Gas Heat Only)	0.00	0.00	13.35	0

Annual $ Source: NMR (2018, 2019). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). TXC50 - LIMF Market Rate MF NEI - Phase I.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Wi-Fi Thermostat (Controls Gas Heat Only)	0.00	0.00	0.00	1.00

TRC: LI MF Bundled costs (see Participant listing)

Incentive: LI MF Bundled costs (see Participant listing)

Commerical and Industrial

Advanced Building

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Advanced Building | **Measure Sub Type:** Advanced Building

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Advanced Building	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Advanced Building	multi	1.00	1.00		0.47	0.49	0.25		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Advanced Building	31.30%	35.40%	15.60%	17.70%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI C&I Impact Evaluation of 2013-2015 Custom CDA

RRsp Source: RI C&I Impact Evaluation of 2013-2015 Custom CDA

RRwp Source: RI C&I Impact Evaluation of 2013-2015 Custom CDA

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Advanced Building	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Advanced Building	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.69 / Gross kWh

Incentive: $0.45 / Gross kWh

Air Cooled AC

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** AC | **Measure Sub Type:** Air cooled

Program: C02a Design 2000plus

Measure Description

This measure applies to the installation of high-efficiency single package or split system air source, water source, ground source (closed loop) and groundwater source (open loop) heat pump systems for space conditioning applications.

Baseline Description

Appendix A details the specific efficiency requirements by equipment type.

Savings Principle

The high efficiency case assumes the HVAC equipment exceeds the requirements of the current version of International Energy Conservation Code (IECC) as mandated by Rhode Island State Building Code.

Savings Method

Calculated using site-specific inputs

Unit

Installed unitary AC system for space cooling.

Savings Equation

Gross kWh = Tons × (kBtu/hr per ton) × (1/SEER_base - 1/SEER_ee) × Hours_C

Gross kW = Tons × (kBtu/hr per ton) × (1/EER_base - 1/EER_ee)

Where:

Tons = Rated cooling capacity of the installed equipment: site-specific.

12 kBtu/hr per ton = Conversion factor

SEER_base = Seasonal Energy Efficiency Ratio of the baseline equipment: code

SEER_ee = Seasonal energy efficiency ratio of the high-efficiency unit: site-specific.

Hours_C = Equivalent full load cooling hours

EER_ee = Energy Efficiency Ratio of the new efficient equipment: site-specific. For equipment < 5.4 tons, assume the following conversion: EER≈SEER/1.1

EER_base = Energy Efficiency Ratio of baseline equipment: code. Since IECC 2012 does not provide EER requirements for equipment < 5.4 tons, assume the following conversion: EER ≈ SEER/1.1

Hours: N/A.

Hours Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

Hours Note: If site-specific data is unavailable, the average cooling EFLHs are taken as 855 hours while the average heating EFLHs are taken as 1137 hours.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Air Cooled AC	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Air Cooled AC	20	1.00	1.00		1.00	1.00	1.00	0.40	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Air Cooled AC	11.30%	10.80%	39.40%	38.50%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

RRsp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

RRwp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

CFsp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

CFwp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Air Cooled AC	0.00	0.00	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Air Cooled AC	0.47	0.00	0.00	0.53

NTG Source: TXC 35 MA C&I Upstream HVAC NTG & Market Effects Study

Building Shell

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** BLD SHELL | **Measure Sub Type:** BLD SHELL

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Building Shell	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Building Shell	multi	1.00	1.00		0.83	0.67	0.85		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Building Shell	0.00%	0.00%	50.00%	50.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Building Shell	Calc	Calc	0.04	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Building Shell	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.77 / Gross kWh

Incentive: $0.50 / Gross kWh

CAIR Nozzle

Sector: C&I **Fuel:** Electric **Program Type:** Prescriptive

Measure Category: Compressed Air **Measure Type:** CAIR Nozzle **Measure Sub Type:** CAIR Nozzle

Program: C02a Design 2000plus

Measure Description

The installation of an efficient CAIR nozzle.

Baseline Description

The baseline efficiency case is the installation of a standard CAIR nozzle.

Savings Principle

The high efficiency case is the installation of an efficient CAIR nozzle.

Savings Method

Calculated using site-specific inputs

Unit

Installed CAIR nozzle.

Savings Equation

Gross kWh = CFM_pipe × deltaCFM/CFM_pipe × deltakW/CFM × Hours

Gross kW = CFM_pipe × deltaCFM/CFM_pipe × deltakW/CFM

Where:

CFM_pipe = CFM capacity of piping: site-specific

0.049 deltaCFM/CFM_pipe = Average CFM saved per CFM of piping capacity

0.24386 deltakW/CFM = Average demand savings per CFM; Based on regional analysis assuming a typical timed drain settings discharge scenario.

Hours = Annual operating hours of the zero loss condensate drain: site-specific

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
CAIR Nozzle	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
CAIR Nozzle	15	1.00	1.00		1.00	1.00	1.00	0.80	0.54

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
CAIR Nozzle	24.50%	25.80%	24.50%	25.10%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

RRsp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

RRwp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

CFsp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

CFwp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
CAIR Nozzle	0.00	0.00	0.04	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
CAIR Nozzle	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

Chiller

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** CHILLER | **Measure Sub Type:** CHILLER

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Chiller	Calc	Calc	0.00	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Chiller	multi	1.00	1.00		0.83	0.67	0.85		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Chiller	11.30%	10.80%	39.40%	38.50%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Chiller	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Chiller	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.81 / Gross kWh

Incentive: $0.53 / Gross kWh

CHP

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** CHP | **Measure Sub Type:** CHP

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
CHP	Calc	Calc	0.00	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
CHP	multi	1.00	1.00		1.00	1.00	1.00		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
CHP	0.00%	0.00%	50.00%	50.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
CHP	Calc	Calc	-0.01	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
CHP	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

CODES AND STANDARDS

Sector: C&I

Fuel: Electric

Program Type: Custom

Measure Category: Codes and Standards

Measure Type: Codes and Standards

Measure Sub Type: Codes and Standards

Program: C02a Design 2000plus

Measure Description

Energy efficiency code trainings and advocacy work to improve energy efficiency of buildings and equipment within Rhode Island.

Baseline Description

Un-influenced adoption curve of federal minimum codes and standards.

Savings Principle

Accelerated adoption of advancing energy codes and equipment standards.

Savings Method

Calculated based on attribution study

Unit

Adoption of advancing energy codes and equipment standards.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
CODES AND STANDARDS	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: NMR - Rhode Island Code Compliance Enhancement Initiative Attribution and Savings Study

Gas Heat MMBtu Source: NMR - Rhode Island Code Compliance Enhancement Initiative Attribution and Savings Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
CODES AND STANDARDS	20	1.00	1.00		1.00	0.91	0.76		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
CODES AND STANDARDS	37.11%	29.56%	18.55%	14.78%

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRsp Note: Realization rate is assumed 100% because energy savings are custom calculated.

RRwp Note: Realization rate is assumed 100% because energy savings are custom calculated.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
CODES AND STANDARDS	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
CODES AND STANDARDS	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

Commercial Electric Combination Oven

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Food Service | **Measure Type:** Cooking Equipment | **Measure Sub Type:** Oven

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® commercial oven. ENERGY STAR® commercial ovens save energy during preheat, cooking and idle times due to improved cooking efficiency, and preheat and idle energy rates.

Baseline Description

The baseline efficiency case for a combination oven is a commercial combination oven with a cooking energy efficiency of 65% with a production capacity of 100 pounds per hour for oven mode and 40% steam cooking energy efficiency, with a production capacity of 150 pounds per hour for steam mode. Idle energy is assumed to be 3.7 kW for oven mode and 12.5 kW for steam mode.

Savings Principle

The high efficiency case for a combination oven is a commercial combination oven with a cooking energy efficiency of 70% with a production capacity of 125 pounds per hour for oven mode, and 70% cooking energy efficiency with a production capacity of 200 pounds per hour for steam mode, and idle energy rate of 2.5 kW for convection mode and 6.0 kW for steam mode.

Savings Method

Deemed

Unit

Installed high-efficiency commercial electric oven.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Commercial Electric Combination Oven	15,095.0	3.5000	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Commercial Electric Combination Oven	12	1.00	1.00		1.00	1.00	1.00	0.90	0.90

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Commercial Electric Combination Oven	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Pacific Gas & Electric Company – Customer Energy Efficiency Department (2007). Work Paper PGECOFST101, Commercial Convection Oven, Revision #0.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: 100% realization rates are assumed because savings are based on researched assumptions by FSTC.

RRsp Note: 100% realization rates are assumed because savings are based on researched assumptions by FSTC.

RRwp Note: 100% realization rates are assumed because savings are based on researched assumptions by FSTC.

CFsp Source: P72 Prescriptive C&I Loadshapes of Savings

CFsp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

CFwp Source: P72 Prescriptive C&I Loadshapes of SavingsCFwp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Commercial Electric Combination Oven	0.00	0.00	0.23	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Commercial Electric Combination Oven	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.28 / Gross kWh

Incentive: $0.18 / Gross kWh

Commercial Electric Convection Oven

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Food Service | **Measure Type:** Cooking Equipment | **Measure Sub Type:** Oven

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® commercial oven. ENERGY STAR® commercial ovens save energy during preheat, cooking and idle times due to improved cooking efficiency, and preheat and idle energy rates.

Baseline Description

The baseline efficiency case is a convection oven with a cooking energy efficiency of 65%, production capacity of 90 pounds per hour, and idle energy rate of 2.0 kW.

Savings Principle

The high efficiency case is a convection oven with a cooking energy efficiency of 74%, production capacity of 85 pounds per hour, and idle energy rate of 1.4 kW.

Savings Method

Deemed

Unit

Installed high-efficiency commercial electric oven.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Commercial Electric Convection Oven	2,787.0	0.7000	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Commercial Electric Convection Oven	12	1.00	1.00		1.00	1.00	1.00	0.90	0.90

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Commercial Electric Convection Oven	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Pacific Gas & Electric Company – Customer Energy Efficiency Department (2007). Work Paper PGECOFST101, Commercial Convection Oven, Revision #0.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: 100% realization rates are assumed because savings are based on researched assumptions by FSTC.

RRsp Note: 100% realization rates are assumed because savings are based on researched assumptions by FSTC.

RRwp Note: 100% realization rates are assumed because savings are based on researched assumptions by FSTC.

CFsp Source: P72 Prescriptive C&I Loadshapes of Savings

CFsp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

CFwp Source: P72 Prescriptive C&I Loadshapes of SavingsCFwp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Commercial Electric Convection Oven	0.00	0.00	0.23	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Commercial Electric Convection Oven	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.28 / Gross kWh

Incentive: $0.18 / Gross kWh

Commercial Electric Fryer - Large

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Food Service | **Measure Type:** Cooking Equipment | **Measure Sub Type:** Fryer

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® commercial fryer, which saves energy during preheating, cooking, and idling.

Baseline Description

The baseline efficiency case is a deep-fat fryer with a cooking efficiency of 70%, a shortening capacity of up to 100 pounds, and an idle energy rate of 1.35 kW.

Savings Principle

The high efficiency case is a deep-fat fryer with a cooking energy efficiency of 85%, a shortening capacity of over 70 pounds, and an idle energy rate of 1.10 kW.

Savings Method

Deemed

Unit

Installed high-efficiency electric fryer.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 3,756.0.

Hours Note: Fryers are assumed to operate 313 days per year, or 6 days per week, based on a MA common assumption.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Commercial Electric Fryer - Large	2,841.0	0.5000	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Commercial Electric Fryer - Large	12	1.00	1.00		1.00	1.00	1.00	0.90	0.90

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Commercial Electric Fryer - Large	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Pacific Gas & Electric Company – Customer Energy Efficiency Department (2007). Work Paper PGECOFST101, Commercial Convection Oven, Revision #0.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: All PAs use 100% savings persistence factors.

RRe Note: Realization rate is assumed to be 100%.

RRsp Note: Realization rate is assumed to be 100%.

RRwp Note: Realization rate is assumed to be 100%.

CFsp Source: P72 Prescriptive C&I Loadshapes of Savings

CFsp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

CFwp Source: P72 Prescriptive C&I Loadshapes of SavingsCFwp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Commercial Electric Fryer - Large	0.00	0.00	0.23	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Commercial Electric Fryer - Large	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.14 / Gross kWh

Incentive: $0.09 / Gross kWh

Commercial Electric Fryer - Standard

Sector: C&I **Fuel:** Electric **Program Type:** Prescriptive

Measure Category: Food Service **Measure Type:** Cooking Equipment **Measure Sub Type:** Fryer

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® commercial fryer, which saves energy during preheating, cooking, and idling.

Baseline Description

The baseline efficiency case is a deep-fat fryer with a cooking efficiency of 75%, a shortening capacity of up to 65 pounds, and an idle energy rate of 1.20 kW.

Savings Principle

The high efficiency case is a deep-fat fryer with a cooking energy efficiency of 85%, a shortening capacity of up to 70 pounds, and an idle energy rate of 0.86 kW.

Savings Method

Deemed

Unit

Installed high-efficiency electric fryer.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 3,756.0.

Hours Note: Fryers are assumed to operate 313 days per year, or 6 days per week, based on a MA common assumption.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Commercial Electric Fryer - Standard	2,976.0	0.5000	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Commercial Electric Fryer - Standard	12	1.00	1.00		1.00	1.00	1.00	0.90	0.90

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Commercial Electric Fryer - Standard	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Pacific Gas & Electric Company – Customer Energy Efficiency Department (2007). Work Paper PGECOFST101, Commercial Convection Oven, Revision #0.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: All PAs use 100% savings persistence factors.

RRe Note: Realization rate is assumed to be 100%.

RRsp Note: Realization rate is assumed to be 100%.

RRwp Note: Realization rate is assumed to be 100%.

CFsp Source: P72 Prescriptive C&I Loadshapes of Savings

CFsp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

CFwp Source: P72 Prescriptive C&I Loadshapes of SavingsCFwp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Commercial Electric Fryer - Standard	0.00	0.00	0.23	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Commercial Electric Fryer - Standard	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.14 / Gross kWh

Incentive: $0.09 / Gross kWh

Commercial Electric Griddle

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Food Service | **Measure Type:** Cooking Equipment | **Measure Sub Type:** Griddle

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® griddle. ENERGY STAR® griddles save energy during preheat, cooking and idle times due to improved cooking efficiency, and preheat and idle energy rates.

Baseline Description

The baseline efficiency case is a typically sized, 6 sq. ft. commercial griddle with a cooking energy efficiency of 65%, production capacity of 35 pounds per hour, and idle energy rate of 400 W/sq. ft.

Savings Principle

The high efficiency case is a typically sized, 6 sq. ft. commercial griddle with a cooking energy efficiency of 75%, production capacity of 49.2 pounds per hour, and idle energy rate of 293 W/sq. ft.

Savings Method

Deemed

Unit

Installed high-efficiency commercial electric griddle.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 3,756.0.

Hours Source: Technical Assessment of Commercial Ovens <http://www.fishnick.com/equipment/techassessment/7_ovens.pdf>, pg.23

Hours Note: Griddles are assumed to operate 313 days per year. Combination ovens are assumed to operate 12 hours a day, or 3756 hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Commercial Electric Griddle	3,965.0	0.9000	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Commercial Electric Griddle	12	1.00	1.00		1.00	1.00	1.00	0.90	0.90

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Commercial Electric Griddle	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Food Service Technology Center (2011). Electric Griddle Life-Cycle Cost Calculator. Accessed on 10/12/2011.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: 100% realization rates are assumed because savings are based on researched assumptions by FSTC.

RRsp Note: 100% realization rates are assumed because savings are based on researched assumptions by FSTC.

RRwp Note: 100% realization rates are assumed because savings are based on researched assumptions by FSTC.

CFsp Source: P72 Prescriptive C&I Loadshapes of Savings

CFsp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

CFwp Source: P72 Prescriptive C&I Loadshapes of SavingsCFwp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Commercial Electric Griddle	0.00	0.00	0.23	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Commercial Electric Griddle	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.48 / Gross kWh

Incentive: $0.31 / Gross kWh

Commercial Electric Steamer

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Food Service | **Measure Type:** Cooking Equipment | **Measure Sub Type:** Steamer

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® commercial steam cooker. ENERGY STAR® steam cookers save energy during cooling and idle times due to improved cooking efficiency and idle energy rates.

Baseline Description

The Baseline Efficiency case is an electric steam cooker with a cooking efficiency of 26%, pan production capacity of 70.0 pounds per hour, preheat energy of 1.5 kWh, and idle energy rate of 1.0 kW

Savings Principle

The High Efficiency case is an ENERGY STAR® electric steam cooker with a cooking energy efficiency of 68%, pan production capacity of 88.0 pounds per hour, preheat energy of 1.5 kWh, and an idle energy rate of 0.26 kW.

Savings Method

Deemed

Unit

Installed high-efficiency commercial electric steamer.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Commercial Electric Steamer	30,156.0	6.8900	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Commercial Electric Steamer	12	1.00	1.00		1.00	1.00	1.00	0.90	0.90

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Commercial Electric Steamer	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Environmental Protection Agency (2011). Savings Calculator for ENERGY Star Qualified Commercial Kitchen Equipment: Steam Cooker Calcs. Accessed on 10/12/2011.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: 100% realization rates are assumed because savings are based on researched assumptions by FSTC.

RRsp Note: 100% realization rates are assumed because savings are based on researched assumptions by FSTC.

RRwp Note: 100% realization rates are assumed because savings are based on researched assumptions by FSTC.

CFsp Source: P72 Prescriptive C&I Loadshapes of Savings

CFsp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

CFwp Source: P72 Prescriptive C&I Loadshapes of SavingsCFwp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Commercial Electric Steamer	0.00	0.00	0.23	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Commercial Electric Steamer	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.12 / Gross kWh

Incentive: $0.08 / Gross kWh

Commercial Refrigeration

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** REFRG COMM | **Measure Sub Type:** REFRG COMM

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Commercial Refrigeration	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Commercial Refrigeration	multi	1.00	1.00		0.83	0.67	0.85		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Commercial Refrigeration	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Commercial Refrigeration	Calc	Calc	0.01	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Commercial Refrigeration	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.71 / Gross kWh

Incentive: $0.46 / Gross kWh

Comprehensive Design

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** COMP DESIGN | **Measure Sub Type:** COMP DESIGN

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Comprehensive Design	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Comprehensive Design	multi	1.00	1.00		0.47	0.49	0.25		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Comprehensive Design	31.30%	35.40%	15.60%	17.70%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI C&I Impact Evaluation of 2013-2015 Custom CDA

RRsp Source: RI C&I Impact Evaluation of 2013-2015 Custom CDA

RRwp Source: RI C&I Impact Evaluation of 2013-2015 Custom CDA

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Comprehensive Design	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Comprehensive Design	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.68 / Gross kWh

Incentive: $0.44 / Gross kWh

Compressed Air

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** COMP AIR | **Measure Sub Type:** COMP AIR

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Compressed Air	Calc	Calc	0.00	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Compressed Air	multi	1.00	1.00		0.81	0.71	0.86		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Compressed Air	41.70%	24.90%	20.90%	12.50%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRsp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRwp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Compressed Air	Calc	Calc	0.03	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Compressed Air	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.60 / Gross kWh

Incentive: $0.39 / Gross kWh

Conveyor Broiler, <22" wide

Sector: C&I **Fuel:** Electric **Program Type:** Prescriptive

Measure Category: Food Service **Measure Type:** Broiler **Measure Sub Type:** Conveyor Broiler

Program: C02a Design 2000plus

Measure Description

Installation of a energy efficiency underfired broiler to replace a conventional automatic constant input rate conveyor broiler. This measure has both electric and gas savings.

Baseline Description

Baseline broiler must be an automatic conveyor broiler capable of maintaining a temperature above 600 F with a tested idle rate greater than 40 kBtu/h.

Savings Principle

The high efficiency case for a conveyor broiler must have a catalyst and an input rate less than 80 kBtu/h or a dual stage or modulating gas valve with a capability of throttling the input rate below 80 kBtu/h. Baseline broiler must be replaced by a broiler similar in size or smaller. Must be installed under a Type II Hood.

Savings Method

Deemed

Unit

Installation of conveyor broiler

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Conveyor Broiler, <22" wide	7,144.0	0.2800	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: SoCalGas Commercial Conveyor Broilers workpaper WPSCGNRCC171226A11, December 27, 2017.

Electric kW Source: SoCalGas Commercial Conveyor Broilers workpaper WPSCGNRCC171226A11, December 27, 2017.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Conveyor Broiler, <22" wide	12	1.00	1.00		1.00			0.90	0.90

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Conveyor Broiler, <22" wide	32.00%	35.00%	16.00%	17.00%

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rates are 100% since savings estimates are based on evaluation results.

CFsp Source: P72 Prescriptive C&I Loadshapes of Savings

CFsp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

CFwp Source: P72 Prescriptive C&I Loadshapes of SavingsCFwp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Conveyor Broiler, <22" wide	0.00	0.00	0.23	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Conveyor Broiler, <22" wide	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

Conveyor Broiler, >28" wide

Sector: C&I **Fuel:** Electric **Program Type:** Prescriptive

Measure Category: Food Service **Measure Type:** Broiler **Measure Sub Type:** Conveyor Broiler

Program: C02a Design 2000plus

Measure Description

Installation of a energy efficiency underfired broiler to replace a conventional automatic constant input rate conveyor broiler. This measure has both electric and gas savings.

Baseline Description

Baseline broiler must be an automatic conveyor broiler capable of maintaining a temperature above 600 F with a tested idle rate greater than 70 kBtu/h.

Savings Principle

The high efficiency case for a conveyor broiler must have a catalyst and an input rate less than 80 kBtu/h or a dual stage or modulating gas valve with a capability of throttling the input rate below 80 kBtu/h. Baseline broiler must be replaced by a broiler similar in size or smaller. Must be installed under a Type II Hood.

Savings Method

Deemed

Unit

Installation of conveyor broiler

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Conveyor Broiler, >28" wide	23,849.0	0.2800	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: SoCalGas Commercial Conveyor Broilers workpaper WPSCGNRCC171226A11, December 27, 2017.

Electric kW Source: SoCalGas Commercial Conveyor Broilers workpaper WPSCGNRCC171226A11, December 27, 2017.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Conveyor Broiler, >28" wide	12	1.00	1.00		1.00			0.90	0.90

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Conveyor Broiler, >28" wide	32.00%	35.00%	16.00%	17.00%

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rates are 100% since savings estimates are based on evaluation results.

CFsp Source: P72 Prescriptive C&I Loadshapes of Savings

CFsp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

CFwp Source: P72 Prescriptive C&I Loadshapes of SavingsCFwp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Conveyor Broiler, >28" wide	0.00	0.00	0.23	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Conveyor Broiler, >28" wide	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $1.51 / Gross kWh

Incentive: $0.98 / Gross kWh

Conveyor Broiler, 22-28" wide

Sector: C&I **Fuel:** Electric **Program Type:** Prescriptive

Measure Category: Food Service **Measure Type:** Broiler **Measure Sub Type:** Conveyor Broiler

Program: C02a Design 2000plus

Measure Description

Installation of a energy efficiency underfired broiler to replace a conventional automatic constant input rate conveyor broiler. This measure has both electric and gas savings.

Baseline Description

Baseline broiler must be an automatic conveyor broiler capable of maintaining a temperature above 600 F with a tested idle rate greater than 60 kBtu/h.

Savings Principle

The high efficiency case for a conveyor broiler must have a catalyst and an input rate less than 80 kBtu/h or a dual stage or modulating gas valve with a capability of throttling the input rate below 80 kBtu/h. Baseline broiler must be replaced by a broiler similar in size or smaller. Must be installed under a Type II Hood.

Savings Method

Deemed

Unit

Installation of conveyor broiler

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Conveyor Broiler, 22-28" wide	6,403.0	0.2800	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: SoCalGas Commercial Conveyor Broilers workpaper WPSCGNRCC171226A11, December 27, 2017.

Electric kW Source: SoCalGas Commercial Conveyor Broilers workpaper WPSCGNRCC171226A11, December 27, 2017.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Conveyor Broiler, 22-28" wide	12	1.00	1.00		1.00			0.90	0.90

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Conveyor Broiler, 22-28" wide	32.00%	35.00%	16.00%	17.00%

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rates are 100% since savings estimates are based on evaluation results.

CFsp Source: P72 Prescriptive C&I Loadshapes of Savings

CFsp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

CFwp Source: P72 Prescriptive C&I Loadshapes of SavingsCFwp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Conveyor Broiler, 22-28" wide	0.00	0.00	0.23	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Conveyor Broiler, 22-28" wide	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

Custom HVAC

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** HVAC | **Measure Sub Type:** HVAC

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Custom HVAC	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Custom HVAC	multi	1.00	1.00		0.83	0.67	0.85		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Custom HVAC	45.80%	20.90%	22.90%	10.40%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Custom HVAC	Calc	Calc	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Custom HVAC	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.81 / Gross kWh

Incentive: $0.53 / Gross kWh

Dishwasher - High Temperature Door Type

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Food Service | **Measure Type:** Dishwasher | **Measure Sub Type:** High Temp, Door Type

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® high temperature commercial dishwasher in a building with gas domestic hot water. High temperature dishwashers use a

booster heater to raise the rinse water temperature to 1800 F – hot enough to sterilize dishes and assist in drying. Electric savings are achieved through savings to the electric booster.

Baseline Description

The baseline efficiency case is a commercial dishwasher with 0.87 kW idle energy rate and 1.29 gal/rack water consumption.

Savings Principle

The high efficiency case is a commercial dishwasher with 0.70 kW idle energy rate and 0.89 gal/rack water consumption or lower following ENERGY STAR efficiency requirements.

Savings Method

Deemed

Unit

Installed Dishwasher

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 5,634.0.

Hours Note: Dishwashers are assumed to operate 313 days per year. The average dishwasher is assumed to operate 18 hours per day, or 5,634 hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dishwasher - High Temperature Door Type	4,151.0	0.7400	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dishwasher - High Temperature Door Type	15	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dishwasher - High Temperature Door Type	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Savings Calculator for ENERGY STAR® Certified Commercial Kitchen Equipment: Dishwasher Calcs. <http://www.energystar.gov/buildings/sites/default/uploads/files/commercial_kitchen_equipment_calculator.xlsx >

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rates are 100% since savings estimates are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dishwasher - High Temperature Door Type	35000.00	35000.00	0.23	0

Water/Sewer Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dishwasher - High Temperature Door Type	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.34 / Gross kWh

Incentive: $0.22 / Gross kWh

Dishwasher - High Temperature Multi Tank Conveyor

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Food Service | **Measure Type:** Dishwasher | **Measure Sub Type:** High Temp, Door Type

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® high temperature commercial dishwasher in a building with gas domestic hot water. High temperature dishwashers use a

booster heater to raise the rinse water temperature to 1800 F – hot enough to sterilize dishes and assist in drying. Electric savings are achieved through savings to the electric booster.

Baseline Description

The baseline efficiency case is a commercial dishwasher with 2.59 kW idle energy rate and 0.97 gal/rack water consumption.

Savings Principle

The high efficiency case is a commercial dishwasher with 2.25 kW idle energy rate and 0.54 gal/rack water consumption or lower following ENERGY STAR efficiency requirements.

Savings Method

Deemed

Unit

Installed Dishwasher

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 5,634.0.

Hours Note: Dishwashers are assumed to operate 313 days per year. The average dishwasher is assumed to operate 18 hours per day, or 5,634 hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dishwasher - High Temperature Multi Tank Conveyor	9,630.0	1.7100	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dishwasher - High Temperature Multi Tank Conveyor	20	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dishwasher - High Temperature Multi Tank Conveyor	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Savings Calculator for ENERGY STAR® Certified Commercial Kitchen Equipment: Dishwasher Calcs. <http://www.energystar.gov/buildings/sites/default/uploads/files/commercial_kitchen_equipment_calculator.xlsx >

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rates are 100% since savings estimates are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dishwasher - High Temperature Multi Tank Conveyor	80754.00	80754.00	0.23	0

Water/Sewer Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dishwasher - High Temperature Multi Tank Conveyor	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.15 / Gross kWh

Incentive: $0.10 / Gross kWh

Dishwasher - High Temperature Pots and Pans

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Food Service | **Measure Type:** Dishwasher | **Measure Sub Type:** High Temp, Door Type

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® high temperature commercial dishwasher in a building with gas domestic hot water. High temperature dishwashers use a

booster heater to raise the rinse water temperature to 1800 F – hot enough to sterilize dishes and assist in drying. Electric savings are achieved through savings to the electric booster.

Baseline Description

The baseline efficiency case is a commercial dishwasher with1.20 kW idle energy rate and 0.70 gal/rack water consumption.

Savings Principle

The high efficiency case is a commercial dishwasher with 1.20 kW idle energy rate and 0.58 gal/rack water consumption or lower following ENERGY STAR efficiency requirements.

Savings Method

Deemed

Unit

Installed Dishwasher

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 5,634.0.

Hours Note: Dishwashers are assumed to operate 313 days per year. The average dishwasher is assumed to operate 18 hours per day, or 5,634 hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dishwasher - High Temperature Pots and Pans	1,032.0	0.1800	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dishwasher - High Temperature Pots and Pans	10	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dishwasher - High Temperature Pots and Pans	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Savings Calculator for ENERGY STAR® Certified Commercial Kitchen Equipment: Dishwasher Calcs. <http://www.energystar.gov/buildings/sites/default/uploads/files/commercial_kitchen_equipment_calculator.xlsx >

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rates are 100% since savings estimates are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dishwasher - High Temperature Pots and Pans	10517.00	10517.00	0.23	0

Water/Sewer Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dishwasher - High Temperature Pots and Pans	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $1.38 / Gross kWh

Incentive: $0.90 / Gross kWh

Dishwasher - High Temperature Single Tank Conveyor

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Food Service | **Measure Type:** Dishwasher | **Measure Sub Type:** High Temp, Single Tank

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® high temperature commercial dishwasher in a building with gas domestic hot water. High temperature dishwashers use a

booster heater to raise the rinse water temperature to 1800 F – hot enough to sterilize dishes and assist in drying. Electric savings are achieved through savings to the electric booster.

Baseline Description

The baseline efficiency case is a commercial dishwasher with 1.93 kW idle energy rate and 0.87 gal/rack water consumption.

Savings Principle

The high efficiency case is a commercial dishwasher with 1.50 kW idle energy rate and 0.70 gal/rack water consumption or lower following ENERGY STAR efficiency requirements.

Savings Method

Deemed

Unit

Installed Dishwasher

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 5,634.0.

Hours Note: Dishwashers are assumed to operate 313 days per year. The average dishwasher is assumed to operate 18 hours per day, or 5,634 hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dishwasher - High Temperature Single Tank Conveyor	4,243.0	0.7500	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dishwasher - High Temperature Single Tank Conveyor	20	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dishwasher - High Temperature Single Tank Conveyor	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Savings Calculator for ENERGY STAR® Certified Commercial Kitchen Equipment: Dishwasher Calcs. <http://www.energystar.gov/buildings/sites/default/uploads/files/commercial_kitchen_equipment_calculator.xlsx >

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rates are 100% since savings estimates are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dishwasher - High Temperature Single Tank Conveyor	21300.00	21300.00	0.23	0

Water/Sewer Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dishwasher - High Temperature Single Tank Conveyor	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.55 / Gross kWh

Incentive: $0.36 / Gross kWh

Dishwasher - High Temperature Under Counter

Sector: C&I

Fuel: Electric

Program Type: Prescriptive

Measure Category: Food Service

Measure Type: Dishwasher

Measure Sub Type: High Temp, Under Counter

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® high temperature commercial dishwasher in a building with gas domestic hot water. High temperature dishwashers use a

booster heater to raise the rinse water temperature to 1800 F – hot enough to sterilize dishes and assist in drying. Electric savings are achieved through savings to the electric booster.

Baseline Description

The baseline efficiency case is a commercial dishwasher with 0.76 kW idle energy rate and 1.09 gal/rack water consumption.

Savings Principle

The high efficiency case is a commercial dishwasher with 0.50 kW idle energy rate and 0.86 gal/rack water consumption or lower following ENERGY STAR efficiency requirements.

Savings Method

Deemed

Unit

Installed Dishwasher

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 5,634.0.

Hours Note: Dishwashers are assumed to operate 313 days per year. The average dishwasher is assumed to operate 18 hours per day, or 5,634 hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dishwasher - High Temperature Under Counter	1,791.0	0.3200	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dishwasher - High Temperature Under Counter	10	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dishwasher - High Temperature Under Counter	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Savings Calculator for ENERGY STAR® Certified Commercial Kitchen Equipment: Dishwasher Calcs. <http://www.energystar.gov/buildings/sites/default/uploads/files/commercial_kitchen_equipment_calculator.xlsx >

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rates are 100% since savings estimates are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dishwasher - High Temperature Under Counter	5400.00	5400.00	0.23	0

Water/Sewer Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dishwasher - High Temperature Under Counter	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.45 / Gross kWh

Incentive: $0.29 / Gross kWh

Dishwasher - Low Temperature Door Type

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Food Service | **Measure Type:** Dishwasher | **Measure Sub Type:** Low Temp, Door Type

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® low temperature commercial dishwasher in a facility with electric hot water heating. Low temperature dishwashers use the hot water supplied by the kitchen's existing water heater and use a chemical sanitizing agentin the final rinse cycle and sometimes a drying agent.

Baseline Description

The baseline efficiency case is a commercial dishwasher with 0.60 kW idle energy rate and 2.10 gal/rack water consumption.

Savings Principle

The high efficiency case is a commercial dishwasher with 0.60 kW idle energy rate and 1.18 gal/rack water consumption or lower following ENERGY STAR efficiency requirements.

Savings Method

Deemed

Unit

Installed Dishwasher

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 5,634.0.

Hours Note: Dishwashers are assumed to operate 313 days per year. The average dishwasher is assumed to operate 18 hours per day, or 5,634 hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dishwasher - Low Temperature Door Type	13,851.0	2.4600	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dishwasher - Low Temperature Door Type	15	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dishwasher - Low Temperature Door Type	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Savings Calculator for ENERGY STAR® Certified Commercial Kitchen Equipment: Dishwasher Calcs. <http://www.energystar.gov/buildings/sites/default/uploads/files/commercial_kitchen_equipment_calculator.xlsx >

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rates are 100% since savings estimates are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dishwasher - Low Temperature Door Type	80600.00	80600.00	0.23	0

Water/Sewer Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dishwasher - Low Temperature Door Type	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

Dishwasher - Low Temperature Multi Tank Conveyor

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Food Service | **Measure Type:** Dishwasher | **Measure Sub Type:** Low Temp, Single tank

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® low temperature commercial dishwasher in a facility with electric hot water heating. Low temperature dishwashers use the hot water supplied by the kitchen's existing water heater and use a chemical sanitizing agentin the final rinse cycle and sometimes a drying agent.

Baseline Description

The baseline efficiency case is a commercial dishwasher with 2.00 kW idle energy rate and 1.04 gal/rack water consumption.

Savings Principle

The high efficiency case is a commercial dishwasher with 2.00 kW idle energy rate and 0.54 gal/rack water consumption or lower following ENERGY STAR efficiency requirements.

Savings Method

Deemed

Unit

Installed Dishwasher

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 5,634.0.

Hours Note: Dishwashers are assumed to operate 313 days per year. The average dishwasher is assumed to operate 18 hours per day, or 5,634 hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dishwasher - Low Temperature Multi Tank Conveyor	16,131.0	2.8600	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dishwasher - Low Temperature Multi Tank Conveyor	20	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dishwasher - Low Temperature Multi Tank Conveyor	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Savings Calculator for ENERGY STAR® Certified Commercial Kitchen Equipment: Dishwasher Calcs. <http://www.energystar.gov/buildings/sites/default/uploads/files/commercial_kitchen_equipment_calculator.xlsx >

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rates are 100% since savings estimates are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dishwasher - Low Temperature Multi Tank Conveyor	93900.00	93900.00	0.23	0

Water/Sewer Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dishwasher - Low Temperature Multi Tank Conveyor	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

Dishwasher - Low Temperature Single Tank Conveyor

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Food Service | **Measure Type:** Dishwasher | **Measure Sub Type:** Low Temp, Single tank

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® low temperature commercial dishwasher in a facility with electric hot water heating. Low temperature dishwashers use the hot water supplied by the kitchen's existing water heater and use a chemical sanitizing agentin the final rinse cycle and sometimes a drying agent.

Baseline Description

The baseline efficiency case is a commercial dishwasher with 1.50 kW idle energy rate and 1.31 gal/rack water consumption.

Savings Principle

The high efficiency case is a commercial dishwasher with 1.60 kW idle energy rate and 0.79 gal/rack water consumption or lower following ENERGY STAR efficiency requirements.

Savings Method

Deemed

Unit

Installed Dishwasher

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 5,634.0.

Hours Note: Dishwashers are assumed to operate 313 days per year. The average dishwasher is assumed to operate 18 hours per day, or 5,634 hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dishwasher - Low Temperature Single Tank Conveyor	11,685.0	2.0700	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dishwasher - Low Temperature Single Tank Conveyor	20	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dishwasher - Low Temperature Single Tank Conveyor	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Savings Calculator for ENERGY STAR® Certified Commercial Kitchen Equipment: Dishwasher Calcs. <http://www.energystar.gov/buildings/sites/default/uploads/files/commercial_kitchen_equipment_calculator.xlsx >

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rates are 100% since savings estimates are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dishwasher - Low Temperature Single Tank Conveyor	65100.00	65100.00	0.23	0

Water/Sewer Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dishwasher - Low Temperature Single Tank Conveyor	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.02 / Gross kWh

Incentive: $0.01 / Gross kWh

Dishwasher - Low Temperature Under Counter

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Food Service | **Measure Type:** Dishwasher | **Measure Sub Type:** Low Temp, Under Counter

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® low temperature commercial dishwasher in a facility with electric hot water heating. Low temperature dishwashers use the hot water supplied by the kitchen's existing water heater and use a chemical sanitizing agentin the final rinse cycle and sometimes a drying agent.

Baseline Description

The baseline efficiency case is a commercial dishwasher with 0.50 kW idle energy rate and 1.73 gal/rack water consumption.

Savings Principle

The high efficiency case is a commercial dishwasher with 0.50 kW idle energy rate and 1.19 gal/rack water consumption or lower following ENERGY STAR efficiency requirements.

Savings Method

Deemed

Unit

Installed Dishwasher

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 5,634.0.

Hours Note: Dishwashers are assumed to operate 313 days per year. The average dishwasher is assumed to operate 18 hours per day, or 5,634 hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dishwasher - Low Temperature Under Counter	2,178.0	0.3900	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dishwasher - Low Temperature Under Counter	10	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dishwasher - Low Temperature Under Counter	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Savings Calculator for ENERGY STAR® Certified Commercial Kitchen Equipment: Dishwasher Calcs. <http://www.energystar.gov/buildings/sites/default/uploads/files/commercial_kitchen_equipment_calculator.xlsx >

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rates are 100% since savings estimates are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dishwasher - Low Temperature Under Counter	12700.00	12700.00	0.23	0

Water/Sewer Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dishwasher - Low Temperature Under Counter	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.23 / Gross kWh

Incentive: $0.15 / Gross kWh

Dual Enthalpy Economizer Controls

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Economizer

Program: C02a Design 2000plus

Measure Description

The measure is to upgrade the outside-air dry-bulb economizer to a dual enthalpy economizer. The system will continuously monitor the enthalpy of both the outside air and return air. The system will control the system dampers adjust the outside quantity based on the two readings.

Baseline Description

The baseline efficiency case for this measure assumes the relevant HVAC equipment is operating with a fixed dry-bulb economizer.

Savings Principle

The high efficiency case is the installation of an outside air economizer utilizing two enthalpy sensors, one for outdoor air and one for return air.

Savings Method

Deemed

Unit

Total tons of controlled cooling capacity.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Dual Enthalpy Economizer Controls	289.0	0.2890	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Patel, Dinesh (2001). Energy Analysis: Dual Enthalpy Control. Prepared for NSTAR.

Electric kW Source: Patel, Dinesh (2001). Energy Analysis: Dual Enthalpy Control. Prepared for NSTAR.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Dual Enthalpy Economizer Controls	10	1.00	1.00		1.05	1.00	1.00	0.34	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Dual Enthalpy Economizer Controls	26.40%	16.60%	34.90%	22.10%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: The Fleming Group (1994). Persistence of Commercial/Industrial Non-Lighting Measures, Volume 2, Energy Efficient HVAC and Process Cooling Equipment. Prepared for NE Power Service Co.

RRsp Source: The Fleming Group (1994). Persistence of Commercial/Industrial Non-Lighting Measures, Volume 2, Energy Efficient HVAC and Process Cooling Equipment. Prepared for NE Power Service Co.

RRwp Source: The Fleming Group (1994). Persistence of Commercial/Industrial Non-Lighting Measures, Volume 2, Energy Efficient HVAC and Process Cooling Equipment. Prepared for NE Power Service Co.

CFsp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

CFwp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Dual Enthalpy Economizer Controls	0.00	0.00	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Dual Enthalpy Economizer Controls	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

ECM Fan Motor for HVAC

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Motors | **Measure Sub Type:** ECM Motor

Program: C02a Design 2000plus

Measure Description

This measure is offered through the Cool Choice program and promotes the installation of electronically commutated motors (ECMs) on fan powered terminal boxes, fan coils, and HVAC supply fans on small unitary equipment.

Baseline Description

The baseline efficiency case for this measure assumes the VAV box fans are powered by a single speed fractional horsepower permanent split capacitor (PSC) induction motor.

Savings Principle

The high efficiency case must have a motor installed on new, qualifying HVAC equipment.

Savings Method

Calculated using site-specific inputs

Unit

Installed ECM fan motor.

Savings Equation

Gross kWh = DesignCFM × BoxSizeFactor × %Flow_Annual × Hours

Gross Summer kW = DesignCFM × BoxSizeFactor × %Flow_Summer × Hours

Gross Winter kW = DesignCFM × BoxSizeFactor × %Flow_Winter × Hours

Where:

DesignCFM = Capacity of the VAV box in cubic feet perminute: site-specific.

BoxSizeFactor = Savings factor in Watts/CFM

%Flow_Annual = Average % of design flow over all operating hours

%Flow_Summer = Average % of design flow during summer peak period

%Flow_Winter = Average % of design flow during winter peak period

Hours = Estimated annual operating hours for VAV box fans: site-specific.

DesignCFM = Capacity of the VAV box in cubic feet per minute: site-specific.

Hours = Estimated annual operating hours for VAV box fans: site-specific.

Hours: N/A.

Hours Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

Hours Note: The average cooling EFLHs are taken as 855 hours while the average heating EFLHs are taken as 1137 hours.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
ECM Fan Motor for HVAC	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
ECM Fan Motor for HVAC	20	1.00	1.00		1.00	1.00	1.00		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
ECM Fan Motor for HVAC	23.70%	27.20%	23.80%	25.30%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRsp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRwp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
ECM Fan Motor for HVAC	0.00	0.00	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
ECM Fan Motor for HVAC	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

EMS

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** EMS | **Measure Sub Type:** EMS

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
EMS	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
EMS	multi	1.00	1.00		0.83	0.67	0.85		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
EMS	45.80%	20.90%	22.90%	10.40%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
EMS	Calc	Calc	0.04	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
EMS	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.81 / Gross kWh

Incentive: $0.53 / Gross kWh

Food Service

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** FOOD | **Measure Sub Type:** FOOD

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Food Service	Calc	Calc	0.00	Calc	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Food Service	multi	1.00	1.00		0.83	0.67	0.85		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Food Service	0.00%	0.00%	50.00%	50.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Food Service	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Food Service	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.60 / Gross kWh

Incentive: $0.39 / Gross kWh

Fuel Switch - DHW

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Fuel Switch - DHW | **Measure Sub Type:** Fuel Switch - DHW

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Fuel Switch - DHW	Calc	Calc	0.00	Calc	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Fuel Switch - DHW	multi	1.00	1.00		0.83	0.67	0.85		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Fuel Switch - DHW	0.00%	0.00%	50.00%	50.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Fuel Switch - DHW	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Fuel Switch - DHW	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

Fuel Switch - HVAC

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Fuel Switch - HVAC | **Measure Sub Type:** Fuel Switch - HVAC

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Fuel Switch - HVAC	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Fuel Switch - HVAC	multi	1.00	1.00		0.83	0.67	0.85		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Fuel Switch - HVAC	0.00%	0.00%	50.00%	50.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Fuel Switch - HVAC	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Fuel Switch - HVAC	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

Ground Source Heat Pump (Closed Loop)

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Heat Pumps | **Measure Sub Type:** Ground Source

Program: C02a Design 2000plus

Measure Description

This measure applies to the installation of high-efficiency single package or split system air source, water source, ground source (closed loop) and groundwater source (open loop) heat pump systems for space conditioning applications.

Baseline Description

Appendix A details the specific efficiency requirements by equipment type.

Savings Principle

The high efficiency case assumes a high-efficiency air cooled, water source, ground water source, or ground source heat pump system that exceeds the energy efficiency requirements of the International Energy Conservation Code (IECC) 2015.

Savings Method

Calculated using site-specific inputs

Unit

Installed heat pump system for space cooling / heating.

Savings Equation

Gross kWh = Tons × (kBtu/hr per ton) × [(1/SEER_base - 1/SEER_ee) × Hours_C + CR × (1/HSPF_base - 1/HSPF_ee) × Hours_H]

Gross kW = Tons × (kBtu/hr per ton) × (1/EER_base - 1/EER_ee)

Where:

Tons = Rated cooling capacity of the installed equipment: site-specific.

12 kBtu/hr per ton = Conversion factor

SEER_base = Seasonal Energy Efficiency Ratio of the baseline equipment: code

SEER_ee = Seasonal energy efficiency ratio of the high-efficiency unit: site-specific.

Hours_C = Equivalent full load cooling hours

HSPF_base = Heating Seasonal Performance Factor for baseline equipment: code

HSPF_ee = Heating Seasonal Performance Factor for new efficient equipment: site-specific.

Hours_H = Equivalent full load heating hours

CR = Capacity Ratio converts rated coolingcapacity to heating capacity. For equipment with cooling capacity ≤ 5.4 tons, assume CR=1. For equipment > 5.4 tons, assume CR=1.15; Optimal Energy, Inc. (2008). Memo:Non-Electric enefits Analysis Update. Prepared for Dave Weber, NSTAR.

EER_base = EnergyEfficiency Ratio of baseline equipment.

EER_ee = Energy Efficiency Ratio of the new efficient equipment: site-specific. For equipment < 5.4 tons, assume the following conversion: EER≈SEER/1.1

Hours: N/A.

Hours Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

Hours Note: If site-specific data is unavailable, the average cooling EFLHs are taken as 855 hours while the average heating EFLHs are taken as 1137 hours.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Ground Source Heat Pump (Closed Loop)	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Ground Source Heat Pump (Closed Loop)	25	1.00	1.00		1.05	1.00	1.00	0.40	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Ground Source Heat Pump (Closed Loop)	11.30%	10.80%	39.40%	38.50%

Measure Life Source: Ground Source Heat Pump eTRM Measure Review MA20C15-B-GSHP

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: The Fleming Group (1994). Persistence of Commercial/Industrial Non-Lighting Measures, Volume 2, Energy Efficient HVAC and Process Cooling Equipment. Prepared for NE Power Service Co.

RRsp Source: The Fleming Group (1994). Persistence of Commercial/Industrial Non-Lighting Measures, Volume 2, Energy Efficient HVAC and Process Cooling Equipment. Prepared for NE Power Service Co.

RRwp Source: The Fleming Group (1994). Persistence of Commercial/Industrial Non-Lighting Measures, Volume 2, Energy Efficient HVAC and Process Cooling Equipment. Prepared for NE Power Service Co.

CFsp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

CFwp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Ground Source Heat Pump (Closed Loop)	0.00	0.00	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Ground Source Heat Pump (Closed Loop)	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

Groundwater Source Heat Pump (Open Loop)

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Heat Pumps | **Measure Sub Type:** Groundwater Source

Program: C02a Design 2000plus

Measure Description

This measure applies to the installation of high-efficiency single package or split system air source, water source, ground source (closed loop) and groundwater source (open loop) heat pump systems for space conditioning applications.

Baseline Description

Appendix A details the specific efficiency requirements by equipment type.

Savings Principle

The high efficiency case assumes a high-efficiency air cooled, water source, ground water source, or ground source heat pump system that exceeds the energy efficiency requirements of the International Energy Conservation Code (IECC) 2015.

Savings Method

Calculated using site-specific inputs

Unit

Installed heat pump system for space cooling / heating.

Savings Equation

Gross kWh = Tons × (kBtu/hr per ton) × [(1/SEER_base - 1/SEER_ee) × Hours_C + CR × (1/HSPF_base - 1/HSPF_ee) × Hours_H]

Gross kW = Tons × (kBtu/hr per ton) × (1/EER_base - 1/EER_ee)

Where:

Tons = Rated cooling capacity of the installed equipment: site-specific.

12 kBtu/hr per ton = Conversion factor

SEER_base = Seasonal Energy Efficiency Ratio of the baseline equipment: code

SEER_ee = Seasonal energy efficiency ratio of the high-efficiency unit: site-specific.

Hours_C = Equivalent full load cooling hours

HSPF_base = Heating Seasonal Performance Factor for baseline equipment: code

HSPF_ee = Heating Seasonal Performance Factor for new efficient equipment: site-specific.

Hours_H = Equivalent full load heating hours

CR = Capacity Ratio converts rated coolingcapacity to heating capacity. For equipment with cooling capacity ≤ 5.4 tons, assume CR=1. For equipment > 5.4 tons, assume CR=1.15; Optimal Energy, Inc. (2008). Memo:Non-Electric enefits Analysis Update. Prepared for Dave Weber, NSTAR.

EER_base = EnergyEfficiency Ratio of baseline equipment.

EER_ee = Energy Efficiency Ratio of the new efficient equipment: site-specific. For equipment < 5.4 tons, assume the following conversion: EER≈SEER/1.1

Hours: N/A.

Hours Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

Hours Note: If site-specific data is unavailable, the average cooling EFLHs are taken as 855 hours while the average heating EFLHs are taken as 1137 hours.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Groundwater Source Heat Pump (Open Loop)	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Groundwater Source Heat Pump (Open Loop)	25	1.00	1.00		1.05	1.00	1.00	0.40	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Groundwater Source Heat Pump (Open Loop)	11.30%	10.80%	39.40%	38.50%

Measure Life Source: Ground Source Heat Pump eTRM Measure Review MA20C15-B-GSHP

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: The Fleming Group (1994). Persistence of Commercial/Industrial Non-Lighting Measures, Volume 2, Energy Efficient HVAC and Process Cooling Equipment. Prepared for NE Power Service Co.

RRsp Source: The Fleming Group (1994). Persistence of Commercial/Industrial Non-Lighting Measures, Volume 2, Energy Efficient HVAC and Process Cooling Equipment. Prepared for NE Power Service Co.

RRwp Source: The Fleming Group (1994). Persistence of Commercial/Industrial Non-Lighting Measures, Volume 2, Energy Efficient HVAC and Process Cooling Equipment. Prepared for NE Power Service Co.

CFsp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

CFwp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Groundwater Source Heat Pump (Open Loop)	0.00	0.00	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Groundwater Source Heat Pump (Open Loop)	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

High Performance Contact Conveyor Toaster

Sector: C&I **Fuel:** Electric **Program Type:** Prescriptive

Measure Category: Food Service **Measure Type:** Food Service **Measure Sub Type:** Food Service

Program: C02a Design 2000plus

Measure Description

The Installation of a high performance contact conveyor toaster.

Baseline Description

The baseline is >3.75 W/bun from the 2022 CA eTRM.

Savings Principle

The efficient equipment must be <= 3.75 W/bun.

Savings Method

Deemed

Unit

Installed high performance contact conveyor toaster.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
High Performance Contact Conveyor Toaster	2,340.0	0.3610	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: CA eTRM

Electric kW Source: CA eTRM

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
High Performance Contact Conveyor Toaster	12	1.00	1.00		1.00	1.00	1.00	0.90	0.90

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
High Performance Contact Conveyor Toaster	33.00%	0.00%	67.00%	0.00%

Measure Life Source: Guidehouse, MA Residential Baseline Study

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed 100% because savings are based on researched assumptions.

RRsp Note: Realization rate is assumed 100% because savings are based on researched assumptions.

RRwp Note: Realization rate is assumed 100% because savings are based on researched assumptions.

CFsp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

CFwp Note: Coincidence Factors are 0.9 for both summer and winter seasons to account for restaurants that close one day per week or may not serve lunch and dinner on weekdays.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
High Performance Contact Conveyor Toaster	0.00	0.00	0.01	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
High Performance Contact Conveyor Toaster	0.25	0.00	0.09	0.84

NTG Source: C&I Prescriptive and Custom NTG Omnibus Study (MA20X07-B-CIOMNINTG)

TRC: $1.29 / Gross kWh

Incentive: $0.26 / Gross kWh

Hot Food Holding Cabinet - 1/2

Sector: C&I **Fuel:** Electric **Program Type:** Prescriptive

Measure Category: Food Service **Measure Type:** Hot Food Cabinet **Measure Sub Type:** 1/2

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® hot food holding cabinet (HFHC).

Baseline Description

The baseline efficiency idle energy rate for a HFHC is 400 W for all sizes.

Savings Principle

A HFHC that incorporates better insulation, reducing heat loss, and may also offer additional energy saving devices such as magnetic door gaskets, auto-door closures, or dutch doors. 1/2 size idle energy rate is 172 W.

Savings Method

Deemed

Unit

Per hot food cabinet

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 4,695.0.

Hours Note: Hot food holding cabinets assumed to operate 313 days per year617 for 15 hours a day, or 4,695 hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Hot Food Holding Cabinet - 1/2	1,095.0	0.2000	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Hot Food Holding Cabinet - 1/2	12	1.00	1.00		1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Hot Food Holding Cabinet - 1/2	32.00%	35.00%	16.00%	17.00%

Measure Life Source: ENERGY STAR® Commercial Kitchen Equipment Savings Calculator: HFHC Calcs.
<http://www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/commercial_kitchen_equipment_calculator.xls>

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rates are 100% since savings estimates are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Hot Food Holding Cabinet - 1/2	0.00	0.00	0.23	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Hot Food Holding Cabinet - 1/2	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.81 / Gross kWh

Incentive: $0.59 / Gross kWh

Hot Food Holding Cabinet - 3/4

Sector: C&I **Fuel:** Electric **Program Type:** Prescriptive

Measure Category: Food Service **Measure Type:** Hot Food Cabinet **Measure Sub Type:** 3/4

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® hot food holding cabinet (HFHC).

Baseline Description

The baseline efficiency idle energy rate for a HFHC is 400 W for all sizes.

Savings Principle

A HFHC that incorporates better insulation, reducing heat loss, and may also offer additional energy saving devices such as magnetic door gaskets, auto-door closures, or dutch doors. 3/4 size idle energy rate is 258 W.

Savings Method

Deemed

Unit

Per hot food cabinet

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 4,695.0.

Hours Note: Hot food holding cabinets assumed to operate 313 days per year617 for 15 hours a day, or 4,695 hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Hot Food Holding Cabinet - 3/4	1,095.0	0.2000	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Hot Food Holding Cabinet - 3/4	12	1.00	1.00		1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Hot Food Holding Cabinet - 3/4	32.00%	35.00%	16.00%	17.00%

Measure Life Source: ENERGY STAR® Commercial Kitchen Equipment Savings Calculator: HFHC Calcs.
<http://www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/commercial_kitchen_equipment_calculator.xls>

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rates are 100% since savings estimates are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Hot Food Holding Cabinet - 3/4	0.00	0.00	0.23	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Hot Food Holding Cabinet - 3/4	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $1.13 / Gross kWh

Incentive: $0.73 / Gross kWh

Hot Food Holding Cabinet - Full

Sector: C&I **Fuel:** Electric **Program Type:** Prescriptive

Measure Category: Food Service **Measure Type:** Hot Food Cabinet **Measure Sub Type:** Full

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® hot food holding cabinet (HFHC).

Baseline Description

The baseline efficiency idle energy rate for a HFHC is 400 W for all sizes.

Savings Principle

A HFHC that incorporates better insulation, reducing heat loss, and may also offer additional energy saving devices such as magnetic door gaskets, auto-door closures, or dutch doors. Full size idle energy rate is 294 W.

Savings Method

Deemed

Unit

Per hot food cabinet

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 4,695.0.

Hours Note: Hot food holding cabinets assumed to operate 313 days per year617 for 15 hours a day, or 4,695 hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Hot Food Holding Cabinet - Full	2,737.0	0.5000	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Hot Food Holding Cabinet - Full	12	1.00	1.00		1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Hot Food Holding Cabinet - Full	32.00%	35.00%	16.00%	17.00%

Measure Life Source: ENERGY STAR® Commercial Kitchen Equipment Savings Calculator: HFHC Calcs.
<http://www.energystar.gov/ia/business/bulk_purchasing/bpsavings_calc/commercial_kitchen_equipment_calculator.xls>

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rates are 100% since savings estimates are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Hot Food Holding Cabinet - Full	0.00	0.00	0.23	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Hot Food Holding Cabinet - Full	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.53 / Gross kWh

Incentive: $0.35 / Gross kWh

Ice Making Head

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Food Service | **Measure Type:** Ice Machine | **Measure Sub Type:** Ice Making Head

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® commercial ice machine.

Baseline Description

The baseline efficiency case is a non-ENERGY STAR® commercial ice machine.

Savings Principle

The high efficiency case is a commercial ice machine meeting the ENERGY STAR® Specifications V3.0 Efficiency Requirements.

Savings Method

Deemed

Unit

Per ice machine

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 5,634.0.

Hours Note: Ice making machines are assumed to operate 365 days per year. The average ice making machine is assumed to operate 18 hours per day, or 5,634 hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Ice Making Head	1,117.0	0.2800	0.00	0.00	0.00	0.00	0.00

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Ice Making Head	8	1.00	1.00		1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Ice Making Head	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Savings Calculator for ENERGY STAR® Certified Commercial Kitchen Equipment: Ice Machine Calcs. <http://www.energystar.gov/buildings/sites/default/uploads/files/commercial_kitchen_equipment_calculator.xlsx >

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rates are 100% since savings estimates are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Ice Making Head	3322.00	3322.00	0.23	0

Water/Sewer Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Ice Making Head	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.38 / Gross kWh

Incentive: $0.25 / Gross kWh

Ice Remote (Cont.)

Sector: C&I **Fuel:** Electric **Program Type:** Prescriptive

Measure Category: Food Service **Measure Type:** Ice Machine **Measure Sub Type:** Ice Remote/Split

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® commercial ice machine.

Baseline Description

The baseline efficiency case is a non-ENERGY STAR® commercial ice machine.

Savings Principle

The high efficiency case is a commercial ice machine meeting the ENERGY STAR® Specifications V3.0 Efficiency Requirements.

Savings Method

Deemed

Unit

Per ice machine

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 5,634.0.

Hours Note: Ice making machines are assumed to operate 365 days per year. The average ice making machine is assumed to operate 18 hours per day, or 5,634 hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Ice Remote (Cont.)	3,641.0	0.2800	0.00	0.00	0.00	0.00	0.00

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Ice Remote (Cont.)	8	1.00	1.00		1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Ice Remote (Cont.)	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Savings Calculator for ENERGY STAR® Certified Commercial Kitchen Equipment: Ice Machine Calcs. <http://www.energystar.gov/buildings/sites/default/uploads/files/commercial_kitchen_equipment_calculator.xlsx >

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rates are 100% since savings estimates are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Ice Remote (Cont.)	0.00	0.00	0.23	0

Water/Sewer Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Ice Remote (Cont.)	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.10 / Gross kWh

Incentive: $0.06 / Gross kWh

Ice Self Contained

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Food Service | **Measure Type:** Ice Machine | **Measure Sub Type:** Ice Self Contained

Program: C02a Design 2000plus

Measure Description

Installation of a qualified ENERGY STAR® commercial ice machine.

Baseline Description

The baseline efficiency case is a non-ENERGY STAR® commercial ice machine.

Savings Principle

The high efficiency case is a commercial ice machine meeting the ENERGY STAR® Specifications V3.0 Efficiency Requirements.

Savings Method

Deemed

Unit

Per ice machine

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakWh / Hours

Where:

Qty = Total number of units.

deltakWh = Deemed average annual kWh reduction per unit.

Hours = Deemed average annual operating hours.

Hours: 5,634.0.

Hours Note: Ice making machines are assumed to operate 365 days per year. The average ice making machine is assumed to operate 18 hours per day, or 5,634 hours per year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Ice Self Contained	805.0	0.2800	0.00	0.00	0.00	0.00	0.00

Electric kW Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Ice Self Contained	8	1.00	1.00		1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Ice Self Contained	32.00%	35.00%	16.00%	17.00%

Measure Life Source: Savings Calculator for ENERGY STAR® Certified Commercial Kitchen Equipment: Ice Machine Calcs. <http://www.energystar.gov/buildings/sites/default/uploads/files/commercial_kitchen_equipment_calculator.xlsx >

ISR Note: In-service rates are set to 100% based on the assumption that all purchased units are installed.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rates are 100% since savings estimates are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Ice Self Contained	3526.00	3526.00	0.23	0

Water/Sewer Source: Unit savings are deemed based on the FSTC Commercial Kitchen Equipment Savings Calculator

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Ice Self Contained	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.43 / Gross kWh

Incentive: $0.28 / Gross kWh

LEDs

Sector: C&I **Fuel:** Electric **Program Type:** Custom

Measure Category: Custom **Measure Type:** LEDS **Measure Sub Type:** LEDS

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
LEDs	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
LEDs	multi	1.00	1.00		0.95	0.94	0.75		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
LEDs	40.70%	26.00%	20.30%	13.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRsp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRwp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
LEDs	Calc	Calc	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
LEDs	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.53 / Gross kWh

Incentive: $0.35 / Gross kWh

Lighting Controls

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** LGHT CNTRLS | **Measure Sub Type:** LGHT CNTRLS

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Lighting Controls	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Lighting Controls	9	1.00	1.00		0.95	0.94	0.75		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Lighting Controls	40.70%	26.00%	20.30%	13.00%

Measure Life Source: Dan Mellinger's Lighting Control Measure Life Memo

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRsp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRwp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Lighting Controls	Calc	Calc	0.09	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Lighting Controls	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.53 / Gross kWh

Incentive: $0.35 / Gross kWh

Lighting Systems

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** LGHT SYSTEMS | **Measure Sub Type:** LGHT SYSTEMS

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Lighting Systems	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Lighting Systems	multi	1.00	1.00		0.95	0.94	0.75		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Lighting Systems	40.70%	26.00%	20.30%	13.00%

Measure Life Source: RI C&I Lighting Market and AML Update Study

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRsp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRwp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Lighting Systems	Calc	Calc	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Lighting Systems	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.53 / Gross kWh

Incentive: $0.35 / Gross kWh

Low Pressure Drop Filter

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Compressed Air | **Measure Type:** Low Pressure Drop Filters | **Measure Sub Type:** Low Pressure Drop Filter

Program: C02a Design 2000plus

Measure Description

Filters remove solids and aerosols from compressed air systems. Low pressure drop filters have longer lives and lower pressure drops than traditional coalescing filters resulting in higher efficiencies.

Baseline Description

The baseline efficiency case is a standard coalescing filter with initial drop of between 1 and 2 pounds per sq inch (psi) with an end of life drop of 10 psi.

Savings Principle

The high efficiency case is a low pressure drop filter with initial drop not exceeding 1 psi when new and 3 psi at element change. Filters must be deep-bed, “mist eliminator” style and installed on a single operating compressor rated 15 – 75 HP.

Savings Method

Calculated using site-specific inputs

Unit

Installed filter.

Savings Equation

Gross kWh = Qty × HP_compressor × (kW per HP) × %SAVE × Hours

Gross kW = Qty × HP_compressor × (kW per HP) × %SAVE

Where:

Qty = Number of filters installed: site-specific

HP_compressor = Average compressor load: site-specific

kW per HP = Conversion factor

%SAVE = Percent change in pressure drop: site-specific

Hours = Annual operating hours of the lower pressure drop filter: site-specific

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low Pressure Drop Filter	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low Pressure Drop Filter	15	1.00	1.00		1.00	1.00	1.00	0.80	0.54

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low Pressure Drop Filter	24.50%	25.80%	24.50%	25.10%

Measure Life Note: Based on NSTAR estimates of typical replacement schedule.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: KEMA (2016) Impact Evaluation of 2014 RI Prescriptive Compressed Air Installations

RRsp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

RRwp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

CFsp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

CFwp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low Pressure Drop Filter	0.00	0.00	0.04	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low Pressure Drop Filter	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.43 / Gross kWh

Incentive: $0.28 / Gross kWh

Motor

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** MOTOR | **Measure Sub Type:** MOTOR

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Motor	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Motor	multi	1.00	1.00		0.83	0.67	0.85		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Motor	23.70%	27.20%	23.80%	25.30%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Motor	Calc	Calc	0.02	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Motor	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.34 / Gross kWh

Incentive: $0.22 / Gross kWh

Other

Sector: C&I **Fuel:** Electric **Program Type:** Custom

Measure Category: Custom **Measure Type:** OTHER **Measure Sub Type:** Other

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Other	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Other	multi	1.00	1.00		0.83	0.67	0.85		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Other	42.60%	24.00%	21.30%	12.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Other	Calc	Calc	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Other	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.60 / Gross kWh

Incentive: $0.39 / Gross kWh

Packaged AC to 30 tons

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** PTAC | **Measure Sub Type:** AC to 5.4 tons

Program: C02a Design 2000plus

Measure Description

This measure applies to the installation of high-efficiency single package or split system air source, water source, ground source (closed loop) and groundwater source (open loop) heat pump systems for space conditioning applications.

Baseline Description

Appendix A details the specific efficiency requirements by equipment type.

Savings Principle

The high efficiency case assumes the HVAC equipment exceeds the requirements of the current version of International Energy Conservation Code (IECC) as mandated by Rhode Island State Building Code.

Savings Method

Calculated using site-specific inputs

Unit

Installed unitary AC system for space cooling.

Savings Equation

Gross kWh = Tons × (kBtu/hr per ton) × (1/SEER_base - 1/SEER_ee) × Hours_C

Gross kW = Tons × (kBtu/hr per ton) × (1/EER_base - 1/EER_ee)

Where:

Tons = Rated cooling capacity of the installed equipment: site-specific.

12 kBtu/hr per ton = Conversion factor

SEER_base = Seasonal Energy Efficiency Ratio of the baseline equipment: code

SEER_ee = Seasonal energy efficiency ratio of the high-efficiency unit: site-specific.

Hours_C = Equivalent full load cooling hours

EER_ee = Energy Efficiency Ratio of the new efficient equipment: site-specific. For equipment < 5.4 tons, assume the following conversion: EER≈SEER/1.1

EER_base = Energy Efficiency Ratio of baseline equipment: code. Since IECC 2012 does not provide EER requirements for equipment < 5.4 tons, assume the following conversion: EER ≈ SEER/1.1

Hours: N/A.

Hours Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

Hours Note: If site-specific data is unavailable, the average cooling EFLHs are taken as 855 hours while the average heating EFLHs are taken as 1137 hours.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Packaged AC to 30 tons	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Packaged AC to 30 tons	20	1.00	1.00		1.00	1.00	1.00	0.40	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Packaged AC to 30 tons	11.30%	10.80%	39.40%	38.50%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

RRsp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

RRwp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

CFsp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

CFwp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Packaged AC to 30 tons	0.00	0.00	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Packaged AC to 30 tons	0.45	0.00	0.00	0.55

NTG Source: MA C&I HVAC & Water Heater NTG & Market Effects Measurement

Packaged Terminal Air Conditioner

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** PTAC | **Measure Sub Type:** PTAC

Program: C02a Design 2000plus

Measure Description

This measure applies to the installation of high-efficiency single package or split system air source, water source, ground source (closed loop) and groundwater source (open loop) heat pump systems for space conditioning applications.

Baseline Description

Appendix A details the specific efficiency requirements by equipment type.

Savings Principle

The high efficiency case assumes the HVAC equipment exceeds the requirements of the current version of International Energy Conservation Code (IECC) as mandated by Rhode Island State Building Code.

Savings Method

Calculated using site-specific inputs

Unit

Installed unitary AC system for space cooling.

Savings Equation

Gross kWh = Tons × (kBtu/hr per ton) × (1/SEER_base - 1/SEER_ee) × Hours_C

Gross kW = Tons × (kBtu/hr per ton) × (1/EER_base - 1/EER_ee)

Where:

Tons = Rated cooling capacity of the installed equipment: site-specific.

12 kBtu/hr per ton = Conversion factor

SEER_base = Seasonal Energy Efficiency Ratio of the baseline equipment: code

SEER_ee = Seasonal energy efficiency ratio of the high-efficiency unit: site-specific.

Hours_C = Equivalent full load cooling hours

EER_ee = Energy Efficiency Ratio of the new efficient equipment: site-specific. For equipment < 5.4 tons, assume the following conversion: EER≈SEER/1.1

EER_base = Energy Efficiency Ratio of baseline equipment: code. Since IECC 2012 does not provide EER requirements for equipment < 5.4 tons, assume the following conversion: EER ≈ SEER/1.1

Hours: N/A.

Hours Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

Hours Note: If site-specific data is unavailable, the average cooling EFLHs are taken as 855 hours while the average heating EFLHs are taken as 1137 hours.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Packaged Terminal Air Conditioner	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Packaged Terminal Air Conditioner	20	1.00	1.00		1.00	1.00	1.00	0.40	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Packaged Terminal Air Conditioner	11.30%	10.80%	39.40%	38.50%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

RRsp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

RRwp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

CFsp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

CFwp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Packaged Terminal Air Conditioner	0.00	0.00	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Packaged Terminal Air Conditioner	0.45	0.00	0.00	0.55

NTG Source: MA C&I HVAC & Water Heater NTG & Market Effects Measurement

Packaged Terminal Heat Pumps (PTHP)

Sector: C&I

Fuel: Electric

Program Type: Prescriptive

Measure Category: HVAC

Measure Type: Heat Pumps

Measure Sub Type: Heat Pump, Packaged Terminal

Program: C02a Design 2000plus

Measure Description

Installation of a high efficiency PTHP from a code level PTHP.

Baseline Description

The baseline is a code level PTHP.

Savings Principle

The high efficiency case is a high efficiency PTHP.

Savings Method

Deemed

Unit

Per PTHP

Savings Equation

Gross kWh = Qty × (kW_base - kW_ee) × Hours

Gross kW = Qty × (kW_base - kW_ee)

Where:

Qty = Total number of units.

kW_base = Deemed average demand per baseline unit.

kW_ee = Deemed average demand per high-efficiency unit.

Hours = Deemed average annual operating hours.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Packaged Terminal Heat Pumps (PTHP)	1.0	0.0000	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Based on energy modeling of PNNL prototype buildings of small hotel, large hotel, and multifamily mid-rise.

Electric kW Note: The peak demand occurs in the winter at low ambient temps when supplemental electrical resistance heat is operational. As a result, there is no max kW demand reduction going from PTAC to high efficiency PTHP (existing buildings) or code level PTHP to high

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Packaged Terminal Heat Pumps (PTHP)	8	1.00	1.00		1.00	1.00	1.00	0.01	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Packaged Terminal Heat Pumps (PTHP)	19.10%	16.80%	36.30%	27.80%

Measure Life Source: 'ComEd Effective Useful Life Research Report', May 2018

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization Rate is assumed 100%.

RRwp Note: Realization Rate is assumed 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Packaged Terminal Heat Pumps (PTHP)	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Packaged Terminal Heat Pumps (PTHP)	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $3.08 / Gross kWh

Incentive: $1.73 / Gross kWh

Performance Lighting

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** LGHT-PERF | **Measure Sub Type:** LGHT-PERF

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Performance Lighting	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Performance Lighting	multi	1.00	1.00		0.95	0.94	0.75		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Performance Lighting	40.70%	26.00%	20.30%	13.00%

Measure Life Source: RI C&I Lighting Market and AML Update Study

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRsp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRwp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Performance Lighting	Calc	Calc	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Performance Lighting	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.53 / Gross kWh

Incentive: $0.35 / Gross kWh

Prescriptive Lighting

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Lighting | **Measure Type:** Prescriptive | **Measure Sub Type:** Prescriptive

Program: C02a Design 2000plus

Measure Description

The Installation of efficient lighting discounted at the prescriptive level.

Baseline Description

The baseline case is a mix of fluorescent and halogen fixtures for LEDs and low efficiency fluorescents for high efficiency fluorescents.

Savings Principle

The high efficiency case is high efficiency LED. Please refer to Table 6 in Appendix A for wattage details.

Savings Method

Algorithm with site-specific inputs

Unit

Installed high-efficiency lighting project.

Savings Equation

Gross kWh = SUM[QTY_i × Watts_i × (Hours_base_i - Hours_ee_i)] / (Watts per kW)

Gross kW = SUM(QTY_i × Watts_i) / (Watts per kW)

Where:

QTY_i = Quantity in controlled fixtures in location i

Watts_i = Connected wattage of controlled fixtures in location i

Hours_base_i = Total annual hours that the connected lighting in location i operated without controls (for retrofit installations) or would have operated with code-compliance controls (for new construction installations).

Hours_ee_i = Total annual hours that the connected lighting in location i operates with the lighting controls implemented.

1,000 Watts per kW = Conversion factor

deltaMMBtu_Gas/kWh = Gross natural gas MMBtu reduction per gross kWh saved.

deltaMMBtu_Oil/kWh = Gross heating oil MMBtu reduction per gross kWh saved.

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Prescriptive Lighting	Table 6	Table 6	0.00	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

Gas Heat MMBtu Note: NEI per kWh

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Prescriptive Lighting	multi	1.00	1.00		21.00	21.00	21.00	21.00	21.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Prescriptive Lighting	#VALUE!	#VALUE!	#VALUE!	#VALUE!

Measure Life Source: RI C&I Lighting Market and AML Update Study

Measure Life Note: Massachusetts Common Assumption

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Prescriptive Lighting	0.00	0.00	0.03	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Prescriptive Lighting	21.00	21.00	21.00	21.00

TRC: $0.34 / Gross kWh

Incentive: $0.22 / Gross kWh

Process

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** PROCESS | **Measure Sub Type:** PROCESS

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Process	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Process	multi	1.00	1.00		0.83	0.67	0.85		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Process	45.50%	21.10%	22.80%	10.60%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Process	Calc	Calc	0.01	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Process	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.52 / Gross kWh

Incentive: $0.34 / Gross kWh

Process Cooling

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** PROC-COOLING | **Measure Sub Type:** PROC-COOLING

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Process Cooling	Calc	Calc	0.00	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Process Cooling	multi	1.00	1.00		0.83	0.67	0.85		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Process Cooling	45.50%	21.10%	22.80%	10.60%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Process Cooling	Calc	Calc	0.01	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Process Cooling	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.50 / Gross kWh

Incentive: $0.32 / Gross kWh

Refrigerated Air Dryer

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Compressed Air | **Measure Type:** Refrigerated Air Dryers | **Measure Sub Type:** Refrigerated Air Dryer

Program: C02a Design 2000plus

Measure Description

The installation of cycling or variable frequency drive (VFD)-equipped refrigerated compressed air dryer. An efficient refrigerated dryer cycles on and off or uses a variable speed drive as required by the demand for compressed air instead of running continuously. Only properly sized refrigerated air dryers used in a single-compressor system are eligible.

Baseline Description

The baseline efficiency case is a non-cycling refrigerated air dryer.

Savings Principle

The high efficiency case is a cycling refrigerated dryer or a refrigerated dryer equipped with a VFD.

Savings Method

Calculated using site-specific inputs

Unit

kW saved per CFM of installed air dryer capacity.

Savings Equation

Gross kWh = CFM_dryer × deltakW/CFM × Hours

Gross kW = CFM_dryer × deltakW/CFM

Where:

CFM_dryer = Full flow rated capacity of the refrigerated air dryer in cubic feet per minute (CFM), typically obtained from equipment's Compressed Air Gas Institute Datasheet: site-specific

deltakW/CFM = Refrigerated air dryer kW reduction per dryer full flow rated CFM

Hours = Annual operating hours of the refrigerated air dryer: site-specific

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis; RR adjusts for evaluation results.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Refrigerated Air Dryer	Calc	0.0056	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Algorithm Input kwh/CFM based on NSTAR metering analysis and supported by multiple 3rd part impact evaluations.

Electric kW Source: KEMA (2016) Impact Evaluation of 2014 RI Prescriptive Compressed Air Installations

Electric kW Note: kW/(rated CFM)

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Refrigerated Air Dryer	15	1.00	1.00		1.56	1.00	1.00	1.05	0.83

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Refrigerated Air Dryer	24.50%	25.80%	24.50%	25.10%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: KEMA (2016) Impact Evaluation of 2014 RI Prescriptive Compressed Air Installations

RRsp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

RRwp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

CFsp Source: KEMA (2016) Impact Evaluation of 2014 RI Prescriptive Compressed Air Installations

CFwp Source: KEMA (2016) Impact Evaluation of 2014 RI Prescriptive Compressed Air Installations

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Refrigerated Air Dryer	0.00	0.00	0.04	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Refrigerated Air Dryer	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

Split System AC to 5.4 tons

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** AC | **Measure Sub Type:** Split

Program: C02a Design 2000plus

Measure Description

This measure applies to the installation of high-efficiency single package or split system air source, water source, ground source (closed loop) and groundwater source (open loop) heat pump systems for space conditioning applications.

Baseline Description

Appendix A details the specific efficiency requirements by equipment type.

Savings Principle

The high efficiency case assumes the HVAC equipment exceeds the requirements of the current version of International Energy Conservation Code (IECC) as mandated by Rhode Island State Building Code.

Savings Method

Calculated using site-specific inputs

Unit

Installed unitary AC system for space cooling.

Savings Equation

Gross kWh = Tons × (kBtu/hr per ton) × (1/SEER_base - 1/SEER_ee) × Hours_C

Gross kW = Tons × (kBtu/hr per ton) × (1/EER_base - 1/EER_ee)

Where:

Tons = Rated cooling capacity of the installed equipment: site-specific.

12 kBtu/hr per ton = Conversion factor

SEER_base = Seasonal Energy Efficiency Ratio of the baseline equipment: code

SEER_ee = Seasonal energy efficiency ratio of the high-efficiency unit: site-specific.

Hours_C = Equivalent full load cooling hours

EER_ee = Energy Efficiency Ratio of the new efficient equipment: site-specific. For equipment < 5.4 tons, assume the following conversion: EER≈SEER/1.1

EER_base = Energy Efficiency Ratio of baseline equipment: code. Since IECC 2012 does not provide EER requirements for equipment < 5.4 tons, assume the following conversion: EER ≈ SEER/1.1

Hours: N/A.

Hours Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

Hours Note: If site-specific data is unavailable, the average cooling EFLHs are taken as 855 hours while the average heating EFLHs are taken as 1137 hours.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Split System AC to 5.4 tons	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Split System AC to 5.4 tons	20	1.00	1.00		1.00	1.00	1.00	0.40	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Split System AC to 5.4 tons	11.30%	10.80%	39.40%	38.50%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

RRsp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

RRwp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

CFsp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

CFwp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Split System AC to 5.4 tons	0.00	0.00	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Split System AC to 5.4 tons	0.47	0.00	0.00	0.54

NTG Source: TXC 35 MA C&I Upstream HVAC NTG & Market Effects Study

Transformers

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** TRNS | **Measure Sub Type:** TRNS

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Transformers	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Transformers	multi	1.00	1.00		0.81	0.71	0.86		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Transformers	0.00%	0.00%	50.00%	50.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRsp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRwp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Transformers	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Transformers	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.62 / Gross kWh

Incentive: $0.40 / Gross kWh

Unitary AC to 5.4 tons

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Unitary AC | **Measure Sub Type:** AC to 5.4 tons

Program: C02a Design 2000plus

Measure Description

This measure applies to the installation of high-efficiency single package or split system air source, water source, ground source (closed loop) and groundwater source (open loop) heat pump systems for space conditioning applications.

Baseline Description

Appendix A details the specific efficiency requirements by equipment type.

Savings Principle

The high efficiency case assumes the HVAC equipment exceeds the requirements of the current version of International Energy Conservation Code (IECC) as mandated by Rhode Island State Building Code.

Savings Method

Calculated using site-specific inputs

Unit

Installed unitary AC system for space cooling.

Savings Equation

Gross kWh = Tons × (kBtu/hr per ton) × (1/SEER_base - 1/SEER_ee) × Hours_C

Gross kW = Tons × (kBtu/hr per ton) × (1/EER_base - 1/EER_ee)

Where:

Tons = Rated cooling capacity of the installed equipment: site-specific.

12 kBtu/hr per ton = Conversion factor

SEER_base = Seasonal Energy Efficiency Ratio of the baseline equipment: code

SEER_ee = Seasonal energy efficiency ratio of the high-efficiency unit: site-specific.

Hours_C = Equivalent full load cooling hours

EER_ee = Energy Efficiency Ratio of the new efficient equipment: site-specific. For equipment < 5.4 tons, assume the following conversion: EER≈SEER/1.1

EER_base = Energy Efficiency Ratio of baseline equipment: code. Since IECC 2012 does not provide EER requirements for equipment < 5.4 tons, assume the following conversion: EER ≈ SEER/1.1

Hours: N/A.

Hours Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

Hours Note: If site-specific data is unavailable, the average cooling EFLHs are taken as 855 hours while the average heating EFLHs are taken as 1137 hours.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Unitary AC to 5.4 tons	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Unitary AC to 5.4 tons	12	1.00	1.00		1.00	1.00	1.00	0.40	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Unitary AC to 5.4 tons	8.60%	4.60%	52.70%	34.10%

Measure Life Source: MA19C02-B-EUL - C&I Measure Life Report

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

RRsp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

RRwp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

CFsp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

CFwp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Unitary AC to 5.4 tons	0.00	0.00	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Unitary AC to 5.4 tons	0.47	0.00	0.00	0.53

NTG Source: TXC 35 MA C&I Upstream HVAC NTG & Market Effects Study

Vending Miser - Glass Front Refrigerated Coolers

Sector: C&I **Fuel:** Electric **Program Type:** Prescriptive

Measure Category: Vending Miser **Measure Type:** Vending Miser **Measure Sub Type:** Vending Miser

Program: C02a Design 2000plus

Measure Description

Standard efficiency glass front refrigerated cooler with a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Baseline Description

The baseline efficiency case is a standard efficiency glass front refrigerated cooler without a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Savings Principle

The high efficiency case is a standard efficiency glass front refrigerated cooler without a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Savings Method

Deemed

Unit

Installed vending miser.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: 8,760.0.

Hours Note: It is assumed that the connected equipment operates 24 hours per day, 7 days per week for a total annual operating hours of 8,760.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Vending Miser - Glass Front Refrigerated Coolers	1,208.0	0.1380	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: USA Technologies Energy Management Product Sheets (2006). Accessed on 09/01/2009.

Electric kW Source: USA Technologies Energy Management Product Sheets (2006). Accessed on 09/01/2009.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Vending Miser - Glass Front Refrigerated Coolers	5	1.00	1.00		1.00	1.00	1.00	0.90	0.90

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Vending Miser - Glass Front Refrigerated Coolers	23.00%	27.00%	23.00%	27.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: Impact Evaluation of 2017 Small Business Electric Installations (MA19C03-E-SBIMPCT) (P90)

RRsp Source: Impact Evaluation of 2017 Small Business Electric Installations (MA19C03-E-SBIMPCT) (P90)

RRwp Source: Impact Evaluation of 2017 Small Business Electric Installations (MA19C03-E-SBIMPCT) (P90)

CFsp Source: PY2019 C&I Free Ridership/Spillover study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Vending Miser - Glass Front Refrigerated Coolers	0.00	0.00	0.00	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Vending Miser - Glass Front Refrigerated Coolers	0.18	0.00	0.05	0.87

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.12 / Gross kWh

Incentive: $0.09 / Gross kWh

Vending Miser - Non-Refrigerated Snack Vending Machines UPSTR

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Vending Miser | **Measure Type:** Vending Miser | **Measure Sub Type:** Vending Miser

Program: C02a Design 2000plus

Measure Description

Standard efficiency non-refrigerated snack vending machine with a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Baseline Description

The baseline efficiency case is a standard efficiency nonrefrigerated snack vending machine without a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Savings Principle

The high efficiency case is a standard efficiency nonrefrigerated snack vending machine without a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Savings Method

Deemed

Unit

Installed vending miser.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Vending Miser - Non-Refrigerated Snack Vending Machines UPSTR	343.0	0.0390	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: USA Technologies Energy Management Product Sheets (2006). Accessed on 09/01/2009.

Electric kW Source: USA Technologies Energy Management Product Sheets (2006). Accessed on 09/01/2009.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Vending Miser - Non-Refrigerated Snack Vending Machines UPSTR	5	1.00	1.00		1.00	1.00	1.00	0.90	0.90

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Vending Miser - Non-Refrigerated Snack Vending Machines UPSTR	23.00%	27.00%	23.00%	27.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: Impact Evaluation of 2017 Small Business Electric Installations (MA19C03-E-SBIMPCT) (P90)

RRsp Source: Impact Evaluation of 2017 Small Business Electric Installations (MA19C03-E-SBIMPCT) (P90)

RRwp Source: Impact Evaluation of 2017 Small Business Electric Installations (MA19C03-E-SBIMPCT) (P90)

CFsp Source: PY2019 C&I Free Ridership/Spillover study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Vending Miser - Non-Refrigerated Snack Vending Machines UPSTR	0.00	0.00	0.00	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Vending Miser - Non-Refrigerated Snack Vending Machines UPSTR	0.18	0.00	0.05	0.87

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.41 / Gross kWh

Incentive: $0.32 / Gross kWh

Vending Miser - Refrigerated Beverage Vending Machines UPSTR

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Vending Miser | **Measure Type:** Vending Miser | **Measure Sub Type:** Vending Miser

Program: C02a Design 2000plus

Measure Description

Standard efficiency refrigerated beverage vending machine with a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Baseline Description

The baseline efficiency case is a standard efficiency refrigerated beverage vending machine without a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Savings Principle

The high efficiency case is a standard efficiency refrigerated beverage vending machine with a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Savings Method

Deemed

Unit

Installed vending miser.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: 8,760.0.

Hours Note: It is assumed that the connected equipment operates 24 hours per day, 7 days per week for a total annual operating hours of 8,760.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Vending Miser - Refrigerated Beverage Vending Machines UPSTR	1,612.0	0.1840	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: USA Technologies Energy Management Product Sheets (2006). Accessed on 09/01/2009.

Electric kW Source: USA Technologies Energy Management Product Sheets (2006). Accessed on 09/01/2009.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Vending Miser - Refrigerated Beverage Vending Machines UPSTR	5	1.00	1.00		1.00	1.00	1.00	0.90	0.90

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Vending Miser - Refrigerated Beverage Vending Machines UPSTR	23.00%	27.00%	23.00%	27.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: Impact Evaluation of 2017 Small Business Electric Installations (MA19C03-E-SBIMPCT) (P90)

RRsp Source: Impact Evaluation of 2017 Small Business Electric Installations (MA19C03-E-SBIMPCT) (P90)

RRwp Source: Impact Evaluation of 2017 Small Business Electric Installations (MA19C03-E-SBIMPCT) (P90)

CFsp Source: PY2019 C&I Free Ridership/Spillover study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Vending Miser - Refrigerated Beverage Vending Machines UPSTR	0.00	0.00	0.00	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Vending Miser - Refrigerated Beverage Vending Machines UPSTR	0.18	0.00	0.05	0.87

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.09 / Gross kWh

Incentive: $0.07 / Gross kWh

VSD Compressor (15<=HP<=75)

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Compressed Air | **Measure Type:** Compressor | **Measure Sub Type:** Variable Speed Drive Compressor

Program: C02a Design 2000plus

Measure Description

The installation of oil flooded, rotary screw compressors with Variable Speed Drive capacity control schemes to improve compression efficiencies at partial loads, including a properly sized air receiver.

Baseline Description

The baseline efficiency case is a typical load / unload compressor.

Savings Principle

The high efficiency case is an oil-flooded, rotary screw compressor with Variable Speed Drive capacity control with a properly sized air receiver.

Savings Method

Calculated using site-specific inputs

Unit

kW saved per horsepower (hp) of installed air compressor capacity.

Savings Equation

Gross kWh = HP_compressor × deltakW/HP × Hours

Gross kW = HP_compressor × deltakW/HP

Where:

HP_compressor = Nominal rated horsepower of high efficiency air compressor: site-specific

Hours = Annual operating hours of the air compressor: site-specific

deltakW/HP = Air compressor kW reduction per HP

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis; RR adjusts for evaluation results.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
VSD Compressor (15<=HP<=75)	Calc	0.1900	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Algorithm Input kwh/horsepower based on NSTAR metering analysis and supported by multiple 3rd part impact evaluations.

Electric kW Source: KEMA (2016) Impact Evaluation of 2014 RI Prescriptive Compressed Air Installations

Electric kW Note: kW/HP

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
VSD Compressor (15<=HP<=75)	15	1.00	1.00		1.41	1.00	1.00	1.05	0.83

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
VSD Compressor (15<=HP<=75)	24.50%	25.80%	24.50%	25.10%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: KEMA (2016) Impact Evaluation of 2014 RI Prescriptive Compressed Air Installations

RRsp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

RRwp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

CFsp Source: KEMA (2016) Impact Evaluation of 2014 RI Prescriptive Compressed Air Installations

CFwp Source: KEMA (2016) Impact Evaluation of 2014 RI Prescriptive Compressed Air Installations

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
VSD Compressor (15<=HP<=75)	0.00	0.00	0.04	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
VSD Compressor (15<=HP<=75)	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

VSD-HVAC

Sector: C&I **Fuel:** Electric **Program Type:** Custom

Measure Category: Custom **Measure Type:** VSD **Measure Sub Type:** HVAC

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
VSD-HVAC	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
VSD-HVAC	multi	1.00	1.00		0.83	0.67	0.85		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
VSD-HVAC	23.70%	27.20%	23.80%	25.30%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
VSD-HVAC	Calc	Calc	0.02	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
VSD-HVAC	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.34 / Gross kWh

Incentive: $0.22 / Gross kWh

VSD-NON HVAC

Sector: C&I **Fuel:** Electric **Program Type:** Custom

Measure Category: Custom **Measure Type:** VSD **Measure Sub Type:** Non-HVAC

Program: C02a Design 2000plus

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
VSD-NON HVAC	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
VSD-NON HVAC	multi	1.00	1.00		0.83	0.67	0.85		

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
VSD-NON HVAC	23.70%	27.20%	23.80%	25.30%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
VSD-NON HVAC	Calc	Calc	0.02	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
VSD-NON HVAC	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.34 / Gross kWh

Incentive: $0.22 / Gross kWh

Water Source Heat Pump

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Heat Pumps | **Measure Sub Type:** Ground Source

Program: C02a Design 2000plus

Measure Description

This measure applies to the installation of high-efficiency single package or split system air source, water source, ground source (closed loop) and groundwater source (open loop) heat pump systems for space conditioning applications.

Baseline Description

Appendix A details the specific efficiency requirements by equipment type.

Savings Principle

The high efficiency case assumes a high-efficiency air cooled, water source, ground water source, or ground source heat pump system that exceeds the energy efficiency requirements of the International Energy Conservation Code (IECC) 2015.

Savings Method

Calculated using site-specific inputs

Unit

Installed heat pump system for space cooling / heating.

Savings Equation

Gross kWh = Tons × (kBtu/hr per ton) × [(1/SEER_base - 1/SEER_ee) × Hours_C + CR × (1/HSPF_base - 1/HSPF_ee) × Hours_H]

Gross kW = Tons × (kBtu/hr per ton) × (1/EER_base - 1/EER_ee)

Where:

Tons = Rated cooling capacity of the installed equipment: site-specific.

12 kBtu/hr per ton = Conversion factor

SEER_base = Seasonal Energy Efficiency Ratio of the baseline equipment: code

SEER_ee = Seasonal energy efficiency ratio of the high-efficiency unit: site-specific.

Hours_C = Equivalent full load cooling hours

HSPF_base = Heating Seasonal Performance Factor for baseline equipment: code

HSPF_ee = Heating Seasonal Performance Factor for new efficient equipment: site-specific.

Hours_H = Equivalent full load heating hours

CR = Capacity Ratio converts rated coolingcapacity to heating capacity. For equipment with cooling capacity ≤ 5.4 tons, assume CR=1. For equipment > 5.4 tons, assume CR=1.15; Optimal Energy, Inc. (2008). Memo:Non-Electric enefits Analysis Update. Prepared for Dave Weber, NSTAR.

EER_base = EnergyEfficiency Ratio of baseline equipment.

EER_ee = Energy Efficiency Ratio of the new efficient equipment: site-specific. For equipment < 5.4 tons, assume the following conversion: EER≈SEER/1.1

Hours: N/A.

Hours Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

Hours Note: If site-specific data is unavailable, the average cooling EFLHs are taken as 855 hours while the average heating EFLHs are taken as 1137 hours.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Water Source Heat Pump	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Water Source Heat Pump	12	1.00	1.00		1.05	1.00	1.00	0.40	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Water Source Heat Pump	11.30%	10.80%	39.40%	38.50%

Measure Life Source: DNV GL (2018). Expected Useful Life (EUL) Estimation for Air-Conditioning Equipment from Current Age Distribution Memo.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: The Fleming Group (1994). Persistence of Commercial/Industrial Non-Lighting Measures, Volume 2, Energy Efficient HVAC and Process Cooling Equipment. Prepared for NE Power Service Co.

RRsp Source: The Fleming Group (1994). Persistence of Commercial/Industrial Non-Lighting Measures, Volume 2, Energy Efficient HVAC and Process Cooling Equipment. Prepared for NE Power Service Co.

RRwp Source: The Fleming Group (1994). Persistence of Commercial/Industrial Non-Lighting Measures, Volume 2, Energy Efficient HVAC and Process Cooling Equipment. Prepared for NE Power Service Co.

CFsp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

CFwp Source: KEMA (2011). C&I Unitary HVAC Load Shape Project Final Report. Prepared for the Regional Evaluation, Measurement and Verification Forum.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Water Source Heat Pump	0.00	0.00	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Water Source Heat Pump	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

Zero Loss Condensate Drain

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Compressed Air | **Measure Type:** Zero Loss Condensate Drains | **Measure Sub Type:** Zero Loss Condensate Drain

Program: C02a Design 2000plus

Measure Description

Drains remove water from a compressed air system. Zero loss condensate drains remove water from a compressed air system without venting any air, resulting in less air demand and consequently greater efficiency.

Baseline Description

The baseline efficiency case is the installation of a standard condensate drain on a compressor system.

Savings Principle

The high efficiency case is the installation of a zero loss condensate drain on a single operating compressor rated <= 75 HP.

Savings Method

Calculated using site-specific inputs

Unit

Installed drain.

Savings Equation

Gross kWh = CFM_pipe × deltaCFM/CFM_pipe × deltakW/CFM × Hours

Gross kW = CFM_pipe × deltaCFM/CFM_pipe × deltakW/CFM

Where:

CFM_pipe = CFM capacity of piping: site-specific

0.049 deltaCFM/CFM_pipe = Average CFM saved per CFM of piping capacity

0.24386 deltakW/CFM = Average demand savings per CFM; Based on regional analysis assuming a typical timed drain settings discharge scenario.

Hours = Annual operating hours of the zero loss condensate drain: site-specific

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Zero Loss Condensate Drain	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Zero Loss Condensate Drain	15	1.00	1.00		1.00	1.00	1.00	0.80	0.54

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Zero Loss Condensate Drain	24.50%	25.80%	24.50%	25.10%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: KEMA (2016) Impact Evaluation of 2014 RI Prescriptive Compressed Air Installations

RRsp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

RRwp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

CFsp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

CFwp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Zero Loss Condensate Drain	0.00	0.00	0.04	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Zero Loss Condensate Drain	0.28	0.02	0.02	0.76

NTG Source: PY2019 C&I Free Ridership/Spillover study

Building Operator Certification

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Whole Building | **Measure Type:** BOC Training | **Measure Sub Type:** Certification

Program: C03a Energy Initiative

Measure Description

The Building Operator Certification (BOC) class improves operators' ability to optimize / minimize gas and electricity use in buildings.

Baseline Description

The base case is a building operator without specific training on efficient use of gas and electricity in buildings.

Savings Principle

The high efficiency case is a building operator attending a class on improving the efficiency of gas and electricity use in buildings.

Savings Method

Deemed

Unit

kWh/SF/BOC completion

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Building Operator Certification	0.2	0.0000	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Navigant Consulting (2015). Comprehensive Review of Non-Residential Training and Education Programs, with a Focus on Building Operator Certification. Prepared for the Massachusetts PAs and EEAC

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Building Operator Certification	5	1.00	1.00		1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Building Operator Certification	34.80%	34.80%	13.00%	17.40%

Measure Life Source: Navigant Consulting (2015). Comprehensive Review of Non-Residential Training and Education Programs, with a Focus on Building Operator Certification. Prepared for the Massachusetts PAs and EEAC

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Building Operator Certification	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Building Operator Certification	0.00	0.00	0.00	1.00

Building Operator Certification + Capital Improvements

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Whole Building | **Measure Type:** BOC Training | **Measure Sub Type:** Certification + capital improvements

Program: C03a Energy Initiative

Measure Description

The Building Operator Certification (BOC) class improves operators' ability to optimize / minimize gas and electricity use in buildings.

Baseline Description

The base case is a building operator without specific training on efficient use of gas and electricity in buildings.

Savings Principle

The high efficiency case is a building operator attending a class on improving the efficiency of gas and electricity use in buildings, as well as capital investments in EE projects.

Savings Method

Deemed

Unit

kWh/SF/BOC completion

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Building Operator Certification + Capital Improvements	0.4	0.0000	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: Navigant Consulting (2015). Comprehensive Review of Non-Residential Training and Education Programs, with a Focus on Building Operator Certification. Prepared for the Massachusetts PAs and EEAC

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Building Operator Certification + Capital Improvements	5	1.00	1.00		1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Building Operator Certification + Capital Improvements	34.80%	34.80%	13.00%	17.40%

Measure Life Source: Navigant Consulting (2015). Comprehensive Review of Non-Residential Training and Education Programs, with a Focus on Building Operator Certification. Prepared for the Massachusetts PAs and EEAC

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Building Operator Certification + Capital Improvements	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Building Operator Certification + Capital Improvements	0.00	0.00	0.00	1.00

Comprehensive Retrofit (CR)

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Whole Building | **Measure Sub Type:** Whole Building

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Comprehensive Retrofit (CR)	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Comprehensive Retrofit (CR)	multi	1.00	1.00		0.47	0.49	0.25	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Comprehensive Retrofit (CR)	0.00%	0.00%	50.00%	50.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI C&I Impact Evaluation of 2013-2015 Custom CDA

RRsp Source: RI C&I Impact Evaluation of 2013-2015 Custom CDA

RRwp Source: RI C&I Impact Evaluation of 2013-2015 Custom CDA

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Comprehensive Retrofit (CR)	0.00	0.00	0.06	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Comprehensive Retrofit (CR)	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

Custom CHP

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** CHP | **Measure Sub Type:** CHP

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Custom CHP	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Custom CHP	multi	1.00	1.00		1.00	1.00	1.00	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Custom CHP	31.00%	36.00%	15.00%	18.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRsp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Custom CHP	0.00	0.00	-0.01	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Custom CHP	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

Custom Compressed Air

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Compressed Air | **Measure Sub Type:** Compressed Air

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Custom Compressed Air	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Custom Compressed Air	multi	1.00	1.00		0.83	0.67	0.85	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Custom Compressed Air	32.00%	34.70%	16.00%	17.30%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Custom Compressed Air	0.00	0.00	0.06	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Custom Compressed Air	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.10 / Gross kWh

Incentive: $0.08 / Gross kWh

Custom HVAC

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** HVAC | **Measure Sub Type:** HVAC

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Custom HVAC	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Custom HVAC	multi	1.00	1.00		0.83	0.67	0.85	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Custom HVAC	32.40%	34.30%	16.20%	17.20%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Custom HVAC	0.00	0.00	0.02	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Custom HVAC	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.90 / Gross kWh

Incentive: $0.50 / Gross kWh

Custom Lighting

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Lighting | **Measure Sub Type:** Lighting

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Custom Lighting	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Custom Lighting	multi	1.00	1.00		0.95	0.94	0.75	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Custom Lighting	30.30%	17.40%	34.30%	18.10%

Measure Life Source: RI C&I Lighting Market and AML Update Study

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRsp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRwp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Custom Lighting	0.00	0.00	0.06	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Custom Lighting	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

Custom Motor

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Motor | **Measure Sub Type:** Motor

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Custom Motor	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Custom Motor	multi	1.00	1.00		0.83	0.67	0.85	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Custom Motor	23.70%	27.20%	23.80%	25.30%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Custom Motor	0.00	0.00	0.02	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Custom Motor	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.42 / Gross kWh

Incentive: $0.30 / Gross kWh

Custom Other

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Other | **Measure Sub Type:** Other

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Custom Other	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Custom Other	multi	1.00	1.00		0.83	0.67	0.85	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Custom Other	35.20%	31.40%	17.60%	15.70%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Custom Other	0.00	0.00	0.06	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Custom Other	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $1.04 / Gross kWh

Incentive: $0.20 / Gross kWh

Custom Process

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Process | **Measure Sub Type:** Process

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Custom Process	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Custom Process	multi	1.00	1.00		0.81	0.71	0.86	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Custom Process	32.80%	33.90%	16.40%	16.90%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRsp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRwp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Custom Process	0.00	0.00	0.06	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Custom Process	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.34 / Gross kWh

Incentive: $0.21 / Gross kWh

Custom Refrigeration

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Refrigeration | **Measure Sub Type:** Refrigeration

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Custom Refrigeration	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Custom Refrigeration	multi	1.00	1.00		0.81	0.71	0.86	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Custom Refrigeration	22.60%	27.30%	23.00%	26.80%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRsp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRwp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Custom Refrigeration	0.00	0.00	0.05	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Custom Refrigeration	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.78 / Gross kWh

Incentive: $0.44 / Gross kWh

Custom: SEM

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** SEM | **Measure Sub Type:** SEM

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Custom: SEM	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Custom: SEM	3	1.00	1.00		1.00	1.00	1.00	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Custom: SEM	32.40%	34.30%	16.20%	17.10%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Custom: SEM	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Custom: SEM	0.00	0.00	0.00	1.00

Energy Management System

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Controls | **Measure Sub Type:** Energy Management System

Program: C03a Energy Initiative

Measure Description

The measure is the installation of a new building energy management system (EMS) or the expansion of an existing energy management system for control of non-lighting electric and gas end-uses in an existing building on existing equipment.

Baseline Description

The baseline case is the existing equipment and systems without the implemented controls.

Savings Principle

The high efficiency case is the installation of a new EMS or the expansion of an existing EMS to control additional non-lighting electric and/or gas equipment. The EMS must be installed in an existing building on existing equipment.

Savings Method

Calculated using site-specific inputs

Unit

Upgrade to existing energy management system.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Energy Management System	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Energy Management System	10	1.00	1.00		0.81	0.71	0.86	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Energy Management System	26.40%	16.60%	34.90%	22.10%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRsp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRwp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Energy Management System	0.00	0.00	0.02	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Energy Management System	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.54 / Gross kWh

Incentive: $0.30 / Gross kWh

Food Service

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Food Service | **Measure Sub Type:** Food Service

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Food Service	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Food Service	multi	1.00	1.00		0.83	0.67	0.85	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Food Service	0.00%	0.00%	50.00%	50.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Food Service	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Food Service	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $1.04 / Gross kWh

Incentive: $0.35 / Gross kWh

Fuel Switch - DHW

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Fuel Switch | **Measure Sub Type:** DHW

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Fuel Switch - DHW	Calc	Calc	0.00	Calc	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Fuel Switch - DHW	multi	1.00	1.00		0.83	0.67	0.85	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Fuel Switch - DHW	0.00%	0.00%	50.00%	50.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Fuel Switch - DHW	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Fuel Switch - DHW	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

Fuel Switch - HVAC

Sector: C&I **Fuel:** Electric **Program Type:** Custom

Measure Category: Custom **Measure Type:** Fuel Switch **Measure Sub Type:** HVAC

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Fuel Switch - HVAC	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Fuel Switch - HVAC	multi	1.00	1.00		0.83	0.67	0.85	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Fuel Switch - HVAC	0.00%	0.00%	50.00%	50.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Fuel Switch - HVAC	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Fuel Switch - HVAC	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

Glass Front Refrigerated Coolers

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Refrigeration | **Measure Type:** Controls | **Measure Sub Type:** Vending Miser

Program: C03a Energy Initiative

Measure Description

Controls can significantly reduce the energy consumption of vending machine lighting and refrigeration systems. Qualifying controls must power down these systems during periods of inactivity but, in the case of refrigerated machines, must always maintaina cool product that meets customer expectations. This measure applies to refrigerated beverage vending machines, non-refrigerated snack vending machines, and glass front refrigerated coolers. This measure should not be applied to ENERGY STAR® qualified vending machines, as they already have built-in controls.

Baseline Description

The baseline efficiency case is a standard efficiency refrigerated beverage vending machine, non-refrigerated snack vending machine, or glass front refrigerated cooler without a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Savings Principle

The high efficiency case is a standard efficiency refrigerated beverage vending machine, non-refrigerated snack vending machine, or glass front refrigerated cooler with a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Savings Method

Deemed

Unit

Installed vending miser.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: 8,760.0.

Hours Note: It is assumed that the connected equipment operates 24 hours per day, 7 days per week for a total annual operating hours of 8,760.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Glass Front Refrigerated Coolers	1,208.0	0.1380	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: USA Technologies Energy Management Product Sheets (2006). Accessed on 09/01/2009.

Electric kW Source: USA Technologies Energy Management Product Sheets (2006). Accessed on 09/01/2009.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Glass Front Refrigerated Coolers	5	1.00	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Glass Front Refrigerated Coolers	26.40%	16.60%	34.90%	22.10%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRsp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRwp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

CFsp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

CFwp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Glass Front Refrigerated Coolers	0.00	0.00	0.11	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Glass Front Refrigerated Coolers	0.15	0.00	0.00	0.86

NTG Source: PY2019 C&I Free Ridership/Spillover study

Hotel Occupancy Sensor

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Occupancy Sensor

Program: C03a Energy Initiative

Measure Description

The measure is to the installation of hotel occupancy sensors (HOS) to control packaged terminal AC units (PTACs) with electric heat, heat pump units and/or fan coil units in hotels that operate all 12 months of the year.

Baseline Description

The baseline efficiency case assumes the equipment has no occupancy based controls.

Savings Principle

The high efficiency case is the installation of controls that include (a) occupancy sensors, (b) window/door switches for rooms that have operable window or patio doors, and (c) set back to 65 degrees Fahrenheit in the heating mode and set forward to 78 Fin the cooling mode when occupancy detector is in the unoccupied mode. Sensors controlled by a front desk system are not eligible.

Savings Method

Deemed

Unit

Installed hotel occupancy sensor.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Hotel Occupancy Sensor	438.0	0.0900	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: National Grid and NSTAR (2010). Energy Analysis: Hotel Guest Occupancy Sensors.

Electric kW Source: National Grid and NSTAR (2010). Energy Analysis: Hotel Guest Occupancy Sensors.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Hotel Occupancy Sensor	10	1.00	1.00		1.00	1.00	1.00	0.30	0.70

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Hotel Occupancy Sensor	26.40%	16.60%	34.90%	22.10%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRsp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRwp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

CFsp Note: Coincidence factors are custom calculated based on project-specific detail.

CFwp Note: Coincidence factors are custom calculated based on project-specific detail.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Hotel Occupancy Sensor	0.00	0.00	0.11	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Hotel Occupancy Sensor	0.15	0.00	0.00	0.86

NTG Source: PY2019 C&I Free Ridership/Spillover study

LED

Sector: C&I **Fuel:** Electric **Program Type:** Prescriptive

Measure Category: Lighting **Measure Type:** Upstream **Measure Sub Type:** LED Screw in

Program: C03a Energy Initiative

Measure Description

The installation of efficient lighting discounted at the distribution level.

Baseline Description

The baseline case is a mix of fluorescent and halogen fixtures for LEDs and low efficiency fluorescents for high efficiency fluorescents.

Savings Principle

The high efficiency case is high efficiency LED. Please refer to Table 6 in Appendix A for wattage details.

Savings Method

Deemed

Unit

Installed high-efficiency lighting project.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Hours Note: The annual hours of operation are application specific and can be seen in Table 6: Upstream Lighting.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
LED	Table 6	Table 6	0.00	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

Gas Heat MMBtu Note: NEI per kWh

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
LED	2	0.76	1.00		0.50	0.58	0.46	0.57	0.58

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
LED	30.30%	17.40%	34.30%	18.10%

Measure Life Source: RI C&I Lighting Market and AML Update Study

Measure Life Note: Massachusetts Common Assumption

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

RRsp Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

RRwp Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

CFsp Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

CFwp Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
LED	0.00	0.00	0.03	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
LED	0.27	0.00	0.00	0.73

NTG Source: C&I upstream lighting updated based on 8/1 MA NTG concensus group email

TRC: $0.83 / Gross kWh

Incentive: $0.34 / Gross kWh

LED Exterior

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Lighting | **Measure Type:** Upstream | **Measure Sub Type:** LED Exterior

Program: C03a Energy Initiative

Measure Description

The installation of efficient lighting discounted at the distribution level.

Baseline Description

The baseline case is a mix of fluorescent and halogen fixtures for LEDs and low efficiency fluorescents for high efficiency fluorescents.

Savings Principle

The high efficiency case is high efficiency LED. Please refer to Table 6 in Appendix A for wattage details.

Savings Method

Deemed

Unit

Installed high-efficiency lighting project.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Hours Note: The annual hours of operation are application specific and can be seen in Table 6: Upstream Lighting.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
LED Exterior	Table 6	Table 6	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
LED Exterior	5	0.76	1.00		0.95	0.95	0.95	0.00	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
LED Exterior	30.30%	17.40%	34.30%	18.10%

Measure Life Source: RI C&I Lighting Market and AML Update Study

Measure Life Note: Massachusetts Common Assumption

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: P81 Process Evaluation of C&I Upstream Lighting Initiative [new ISRs]

RRsp Source: P81 Process Evaluation of C&I Upstream Lighting Initiative [new ISRs]

RRwp Source: P81 Process Evaluation of C&I Upstream Lighting Initiative [new ISRs]

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
LED Exterior	0.00	0.00	0.03	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
LED Exterior	0.27	0.00	0.00	0.73

NTG Source: C&I upstream lighting updated based on 8/1 MA NTG concensus group email

TRC: $0.29 / Gross kWh

Incentive: $0.10 / Gross kWh

LED High/Low Bay

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Lighting | **Measure Type:** Upstream | **Measure Sub Type:** LED High/Low Bay

Program: C03a Energy Initiative

Measure Description

The installation of efficient lighting discounted at the distribution level.

Baseline Description

The baseline case is a mix of fluorescent and halogen fixtures for LEDs and low efficiency fluorescents for high efficiency fluorescents.

Savings Principle

The high efficiency case is high efficiency LED. Please refer to Table 6 in Appendix A for wattage details.

Savings Method

Deemed

Unit

Installed high-efficiency lighting project.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Hours Note: The annual hours of operation are application specific and can be seen in Table 6: Upstream Lighting.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
LED High/Low Bay	Table 6	Table 6	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
LED High/Low Bay	7	0.76	1.00		0.93	1.05	0.90	0.66	0.68

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
LED High/Low Bay	30.30%	17.40%	34.30%	18.10%

Measure Life Source: RI C&I Lighting Market and AML Update Study

Measure Life Note: Massachusetts Common Assumption

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: P81 Process Evaluation of C&I Upstream Lighting Initiative [new ISRs]

RRsp Source: P81 Process Evaluation of C&I Upstream Lighting Initiative [new ISRs]

RRwp Source: P81 Process Evaluation of C&I Upstream Lighting Initiative [new ISRs]

CFsp Note: Not include in most recent evaluation; assumed same as stairwell fixtures.

CFwp Note: Not include in most recent evaluation; assumed same as stairwell fixtures.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
LED High/Low Bay	0.00	0.00	0.03	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
LED High/Low Bay	0.27	0.00	0.00	0.73

NTG Source: C&I upstream lighting updated based on 8/1 MA NTG concensus group email

TRC: $0.43 / Gross kWh

Incentive: $0.15 / Gross kWh

LED Stairwell

Sector: C&I **Fuel:** Electric **Program Type:** Prescriptive

Measure Category: Lighting **Measure Type:** Upstream **Measure Sub Type:** LED stairwell

Program: C03a Energy Initiative

Measure Description

The installation of efficient lighting discounted at the distribution level.

Baseline Description

The baseline case is a mix of fluorescent and halogen fixtures for LEDs and low efficiency fluorescents for high efficiency fluorescents.

Savings Principle

The high efficiency case is high efficiency LED. Please refer to Table 6 in Appendix A for wattage details.

Savings Method

Deemed

Unit

Installed high-efficiency lighting project.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Hours Note: The annual hours of operation are application specific and can be seen in Table 6: Upstream Lighting.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
LED Stairwell	Table 6	Table 6	0.00	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

Gas Heat MMBtu Note: NEI per kWh

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
LED Stairwell	7	0.76	1.00		0.86	0.86	0.86	0.66	0.68

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
LED Stairwell	30.30%	17.40%	34.30%	18.10%

Measure Life Source: RI C&I Lighting Market and AML Update Study

Measure Life Note: Massachusetts Common Assumption

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

RRsp Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

RRwp Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

CFsp Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

CFwp Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
LED Stairwell	0.00	0.00	0.03	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
LED Stairwell	0.27	0.00	0.00	0.73

NTG Source: C&I upstream lighting updated based on 8/1 MA NTG concensus group email

TRC: $0.66 / Gross kWh

Incentive: $0.33 / Gross kWh

LEDs

Sector: C&I **Fuel:** Electric **Program Type:** Custom

Measure Category: Custom **Measure Type:** LEDS **Measure Sub Type:** LEDS

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
LEDs	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
LEDs	6	1.00	1.00		0.95	0.94	0.75	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
LEDs	38.40%	28.20%	19.30%	14.10%

Measure Life Source: RI C&I Lighting Market and AML Update Study

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRsp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRwp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
LEDs	0.00	0.00	0.06	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
LEDs	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.83 / Gross kWh

Incentive: $0.34 / Gross kWh

Lighting Controls

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Lighting Controls | **Measure Sub Type:** Lighting Controls

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Lighting Controls	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Lighting Controls	9	1.00	1.00		0.95	0.94	0.75	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Lighting Controls	38.40%	28.20%	19.30%	14.10%

Measure Life Source: Dan Mellinger's Lighting Control Measure Life Memo

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRsp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRwp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Lighting Controls	0.00	0.00	0.10	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Lighting Controls	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.83 / Gross kWh

Incentive: $0.55 / Gross kWh

Linear LED

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Lighting | **Measure Type:** Upstream | **Measure Sub Type:** LED Linear

Program: C03a Energy Initiative

Measure Description

The installation of efficient lighting discounted at the distribution level.

Baseline Description

The baseline case is a mix of fluorescent and halogen fixtures for LEDs and low efficiency fluorescents for high efficiency fluorescents.

Savings Principle

The high efficiency case is high efficiency LED. Please refer to Table 6 in Appendix A for wattage details.

Savings Method

Deemed

Unit

Installed high-efficiency lighting project.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Hours Note: The annual hours of operation are application specific and can be seen in Table 6: Upstream Lighting.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Linear LED	Table 6	Table 6	0.00	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

Gas Heat MMBtu Note: NEI per kWh

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Linear LED	6	0.76	1.00		0.98	1.10	0.95	0.80	0.59

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Linear LED	30.30%	17.40%	34.30%	18.10%

Measure Life Source: RI C&I Lighting Market and AML Update Study

Measure Life Note: Massachusetts Common Assumption

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

RRsp Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

RRwp Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

CFsp Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

CFwp Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Linear LED	0.00	0.00	0.03	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Linear LED	0.37	0.00	0.00	0.63

NTG Source: C&I upstream lighting updated based on 8/1 MA NTG concensus group email

TRC: $0.40 / Gross kWh

Incentive: $0.08 / Gross kWh

Low Pressure Drop Filter

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Compressed Air | **Measure Type:** Filter | **Measure Sub Type:** Low pressure drop filter

Program: C03a Energy Initiative

Measure Description

Filters remove solids and aerosols from compressed air systems. Low pressure drop filters have longer lives and lower pressure drops than traditional coalescing filters resulting in higher efficiencies.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is a low pressure drop filter with initial drop not exceeding 1 psi when new and 3 psi at element change. Filters must be deep-bed, “mist eliminator” style and installed on a single operating compressor rated 15 – 75 HP.

Savings Method

Calculated using site-specific inputs

Unit

Installed filter.

Savings Equation

Gross kWh = Qty × HP_compressor × (kW per HP) × %SAVE × Hours

Gross kW = Qty × HP_compressor × (kW per HP) × %SAVE

Where:

Qty = Number of filters installed: site-specific

HP_compressor = Average compressor load: site-specific

kW per HP = Conversion factor

%SAVE = Percent change in pressure drop: site-specific

Hours = Annual operating hours of the lower pressure drop filter: site-specific

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low Pressure Drop Filter	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Algorithm Input kwh/horsepower based on NSTAR metering analysis and supported by multiple 3rd part impact evaluations.

Electric kW Note: Algorithm Input kwh/horsepower based on NSTAR metering analysis and supported by multiple 3rd part impact evaluations.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low Pressure Drop Filter	13	1.00	1.00		1.00	1.00	1.00	0.80	0.54

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low Pressure Drop Filter	34.20%	28.90%	18.40%	18.40%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: KEMA (2016) Impact Evaluation of 2014 RI Prescriptive Compressed Air Installations

RRsp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

RRwp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

CFsp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

CFwp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low Pressure Drop Filter	0.00	0.00	0.06	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low Pressure Drop Filter	0.15	0.00	0.00	0.86

NTG Source: PY2019 C&I Free Ridership/Spillover study

Non-Refrigerated Snack Vending Machine

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Refrigeration | **Measure Type:** Controls | **Measure Sub Type:** Vending Miser

Program: C03a Energy Initiative

Measure Description

Controls can significantly reduce the energy consumption of vending machine lighting and refrigeration systems. Qualifying controls must power down these systems during periods of inactivity but, in the case of refrigerated machines, must always maintaina cool product that meets customer expectations. This measure applies to refrigerated beverage vending machines, non-refrigerated snack vending machines, and glass front refrigerated coolers. This measure should not be applied to ENERGY STAR® qualified vending machines, as they already have built-in controls.

Baseline Description

The baseline efficiency case is a standard efficiency refrigerated beverage vending machine, non-refrigerated snack vending machine, or glass front refrigerated cooler without a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Savings Principle

The high efficiency case is a standard efficiency refrigerated beverage vending machine, non-refrigerated snack vending machine, or glass front refrigerated cooler with a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Savings Method

Deemed

Unit

Installed vending miser.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: 8,760.0.

Hours Note: It is assumed that the connected equipment operates 24 hours per day, 7 days per week for a total annual operating hours of 8,760.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Non-Refrigerated Snack Vending Machine	343.0	0.0390	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: USA Technologies Energy Management Product Sheets (2006). Accessed on 09/01/2009.

Electric kW Source: USA Technologies Energy Management Product Sheets (2006). Accessed on 09/01/2009.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Non-Refrigerated Snack Vending Machine	5	1.00	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Non-Refrigerated Snack Vending Machine	26.40%	16.60%	34.90%	22.10%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRsp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRwp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

CFsp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

CFwp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Non-Refrigerated Snack Vending Machine	0.00	0.00	0.11	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Non-Refrigerated Snack Vending Machine	0.15	0.00	0.00	0.86

NTG Source: PY2019 C&I Free Ridership/Spillover study

O&M

Sector: C&I **Fuel:** Electric **Program Type:** Custom

Measure Category: Custom **Measure Type:** O & M **Measure Sub Type:** O & M

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
O&M	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
O&M	multi	1.00	1.00		0.83	0.67	0.85	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
O&M	0.00%	0.00%	50.00%	50.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
O&M	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
O&M	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.34 / Gross kWh

Incentive: $0.17 / Gross kWh

Packaged Terminal Heat Pumps (PTHP)

Sector: C&I

Fuel: Electric

Program Type: Prescriptive

Measure Category: HVAC

Measure Type: Heat Pumps

Measure Sub Type: Heat Pump, Packaged Terminal

Program: C03a Energy Initiative

Measure Description

Installation of a high efficiency PTHP to replace an existing PTAC.

Baseline Description

The baseline is an existing PTAC.

Savings Principle

The high efficiency case is a high efficiency PTHP.

Savings Method

Deemed

Unit

Per PTHP

Savings Equation

Gross kWh = Qty × deltakW × Hours

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

DeltakW = Deemed average kW reduction per unit.

Hours = Deemed average annual operating hours.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Packaged Terminal Heat Pumps (PTHP)	1.0	0.0000	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Based on energy modeling of PNNL prototype buildings of small hotel, large hotel, and multifamily mid-rise.

Electric kW Note: The peak demand occurs in the winter at low ambient temps when supplemental electrical resistance heat is operational. As a result, there is no max kW demand reduction going from PTAC to high efficiency PTHP (existing buildings) or code level PTHP to high

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Packaged Terminal Heat Pumps (PTHP)	8	1.00	1.00		1.00	1.00	1.00	0.06	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Packaged Terminal Heat Pumps (PTHP)	31.60%	33.40%	19.80%	15.20%

Measure Life Source: 'ComEd Effective Useful Life Research Report', May 2018

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization Rate is assumed 100%.

RRwp Note: Realization Rate is assumed 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Packaged Terminal Heat Pumps (PTHP)	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Packaged Terminal Heat Pumps (PTHP)	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

TRC: $0.39 / Gross kWh

Incentive: $0.15 / Gross kWh

Prescriptive Lighting

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Lighting | **Measure Type:** Prescriptive | **Measure Sub Type:** Prescriptive

Program: C03a Energy Initiative

Measure Description

The Installation of efficient lighting discounted at the prescriptive level.

Baseline Description

The baseline case is a mix of fluorescent and halogen fixtures for LEDs and low efficiency fluorescents for high efficiency fluorescents.

Savings Principle

The high efficiency case is high efficiency LED. Please refer to Table 6 in Appendix A for wattage details.

Savings Method

Algorithm with site-specific inputs

Unit

Installed high-efficiency lighting project.

Savings Equation

Gross kWh = SUM[QTY_i × Watts_i × (Hours_base_i - Hours_ee_i)] / (Watts per kW)

Gross kW = SUM(QTY_i × Watts_i) / (Watts per kW)

Where:

QTY_i = Quantity in controlled fixtures in location i

Watts_i = Connected wattage of controlled fixtures in location i

Hours_base_i = Total annual hours that the connected lighting in location i operated without controls (for retrofit installations) or would have operated with code-compliance controls (for new construction installations).

Hours_ee_i = Total annual hours that the connected lighting in location i operates with the lighting controls implemented.

1,000 Watts per kW = Conversion factor

deltaMMBtu_Gas/kWh = Gross natural gas MMBtu reduction per gross kWh saved.

deltaMMBtu_Oil/kWh = Gross heating oil MMBtu reduction per gross kWh saved.

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Prescriptive Lighting	Table 6	Table 6	0.00	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

Gas Heat MMBtu Note: NEI per kWh

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Prescriptive Lighting	multi	1.00	1.00		20.00	20.00	20.00	0.49	0.99

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Prescriptive Lighting	30.30%	17.40%	34.30%	18.10%

Measure Life Source: RI C&I Lighting Market and AML Update Study

Measure Life Note: Massachusetts Common Assumption

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: Impact Evaluation of 2011 Rhode Island Prescriptive Retrofit Lighting Installations. Prepared by KEMA. 10/2013

RRsp Source: Impact Evaluation of 2011 Rhode Island Prescriptive Retrofit Lighting Installations. Prepared by KEMA. 10/2013

RRwp Source: Impact Evaluation of 2011 Rhode Island Prescriptive Retrofit Lighting Installations. Prepared by KEMA. 10/2013

CFsp Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

CFwp Source: Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Prescriptive Lighting	0.00	0.00	0.03	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Prescriptive Lighting	0.15	0.10	0.10	1.05

NTG Source: PY2019 C&I Free Ridership/Spillover study

Process Cooling

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Process Cooling | **Measure Sub Type:** Process Cooling

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Process Cooling	Calc	Calc	0.00	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Process Cooling	multi	1.00	1.00		0.83	0.67	0.85	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Process Cooling	32.80%	33.90%	16.40%	16.90%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Process Cooling	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Process Cooling	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.34 / Gross kWh

Incentive: $0.30 / Gross kWh

Refrigerated Beverage Vending Machine

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Refrigeration | **Measure Type:** Controls | **Measure Sub Type:** Vending Miser

Program: C03a Energy Initiative

Measure Description

Controls can significantly reduce the energy consumption of vending machine lighting and refrigeration systems. Qualifying controls must power down these systems during periods of inactivity but, in the case of refrigerated machines, must always maintaina cool product that meets customer expectations. This measure applies to refrigerated beverage vending machines, non-refrigerated snack vending machines, and glass front refrigerated coolers. This measure should not be applied to ENERGY STAR® qualified vending machines, as they already have built-in controls.

Baseline Description

The baseline efficiency case is a standard efficiency refrigerated beverage vending machine, non-refrigerated snack vending machine, or glass front refrigerated cooler without a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Savings Principle

The high efficiency case is a standard efficiency refrigerated beverage vending machine, non-refrigerated snack vending machine, or glass front refrigerated cooler with a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Savings Method

Deemed

Unit

Installed vending miser.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: 8,760.0.

Hours Note: It is assumed that the connected equipment operates 24 hours per day, 7 days per week for a total annual operating hours of 8,760.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Refrigerated Beverage Vending Machine	1,612.0	0.1840	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: USA Technologies Energy Management Product Sheets (2006). Accessed on 09/01/2009.

Electric kW Source: USA Technologies Energy Management Product Sheets (2006). Accessed on 09/01/2009.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Refrigerated Beverage Vending Machine	5	1.00	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Refrigerated Beverage Vending Machine	26.40%	16.60%	34.90%	22.10%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRsp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRwp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

CFsp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

CFwp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Refrigerated Beverage Vending Machine	0.00	0.00	0.11	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Refrigerated Beverage Vending Machine	0.15	0.00	0.00	0.86

NTG Source: PY2019 C&I Free Ridership/Spillover study

Street Lighting

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Street Lights | **Measure Sub Type:** Street lighting

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Street Lighting	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Street Lighting	5	1.00	1.00		0.95	0.94	0.75	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Street Lighting	15.00%	52.00%	7.00%	26.00%

Measure Life Source: RI C&I Lighting Market and AML Update Study

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRsp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRwp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Street Lighting	0.00	0.00	0.06	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Street Lighting	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.83 / Gross kWh

Incentive: $0.24 / Gross kWh

Street Lighting with Controls

Sector: C&I

Fuel: Electric

Program Type: Custom

Measure Category: Custom

Measure Type: Street Lights

Measure Sub Type: Street lighting w/controls

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Street Lighting with Controls	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Street Lighting with Controls	6	1.00	1.00		0.95	0.94	0.75	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Street Lighting with Controls	15.00%	52.00%	7.00%	26.00%

Measure Life Source: RI C&I Lighting Market and AML Update Study

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRsp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRwp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Street Lighting with Controls	0.00	0.00	0.10	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Street Lighting with Controls	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.83 / Gross kWh

Incentive: $0.29 / Gross kWh

Transformers

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Tranformers | **Measure Sub Type:** Tranformers

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Transformers	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Transformers	multi	1.00	1.00		0.81	0.71	0.86	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Transformers	0.00%	0.00%	50.00%	50.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRsp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRwp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Transformers	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Transformers	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $1.04 / Gross kWh

Incentive: $0.35 / Gross kWh

Verified Savings

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Verified savings | **Measure Sub Type:** Verified savings

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Verified Savings	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Verified Savings	multi	1.00	1.00		0.81	0.71	0.86	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Verified Savings	0.00%	0.00%	50.00%	50.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRsp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

RRwp Source: RI-19-CE-CustElec and RI-20-CE-CustElecPY19 - Impact Evaluation of PY2018 and PY2019 Custom Electric Installations

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Verified Savings	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Verified Savings	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

VSD Compressor up to 75 HP

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Compressed Air | **Measure Type:** Compressor | **Measure Sub Type:** VSD compressor up to 75 HP

Program: C03a Energy Initiative

Measure Description

The installation of oil flooded, rotary screw compressors with Variable Speed Drive capacity control schemes to improve compression efficiencies at partial loads, including a properly sized air receiver.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is an oil-flooded, rotary screw compressor with Variable Speed Drive capacity control with a properly sized air receiver.

Savings Method

Calculated using site-specific inputs

Unit

kW saved per horsepower (hp) of installed air compressor capacity.

Savings Equation

Gross kWh = HP_compressor × deltakW/HP × Hours

Gross kW = HP_compressor × deltakW/HP

Where:

HP_compressor = Nominal rated horsepower of high efficiency air compressor: site-specific

Hours = Annual operating hours of the air compressor: site-specific

deltakW/HP = Air compressor kW reduction per HP

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis; RR adjusts for evaluation results.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
VSD Compressor up to 75 HP	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Algorithm Input kwh/horsepower based on NSTAR metering analysis and supported by multiple 3rd part impact evaluations.

Electric kW Note: Algorithm Input kwh/horsepower based on NSTAR metering analysis and supported by multiple 3rd part impact evaluations.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
VSD Compressor up to 75 HP	13	1.00	1.00		1.41	1.00	1.00	1.05	0.83

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
VSD Compressor up to 75 HP	25.50%	25.50%	24.60%	24.30%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: KEMA (2016) Impact Evaluation of 2014 RI Prescriptive Compressed Air Installations

RRsp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

RRwp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

CFsp Source: KEMA (2016) Impact Evaluation of 2014 RI Prescriptive Compressed Air Installations

CFwp Source: KEMA (2016) Impact Evaluation of 2014 RI Prescriptive Compressed Air Installations

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
VSD Compressor up to 75 HP	0.00	0.00	0.06	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
VSD Compressor up to 75 HP	0.15	0.00	0.00	0.86

NTG Source: PY2019 C&I Free Ridership/Spillover study

VSD-HVAC

Sector: C&I **Fuel:** Electric **Program Type:** Custom

Measure Category: Custom **Measure Type:** VSD **Measure Sub Type:** HVAC

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
VSD-HVAC	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
VSD-HVAC	multi	1.00	1.00		0.83	0.67	0.85	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
VSD-HVAC	23.70%	27.20%	23.80%	25.30%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
VSD-HVAC	0.00	0.00	0.02	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
VSD-HVAC	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.42 / Gross kWh

Incentive: $0.35 / Gross kWh

VSD-NON HVAC

Sector: C&I **Fuel:** Electric **Program Type:** Custom

Measure Category: Custom **Measure Type:** VSD **Measure Sub Type:** Non-HVAC

Program: C03a Energy Initiative

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
VSD-NON HVAC	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
VSD-NON HVAC	multi	1.00	1.00		0.83	0.67	0.85	Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
VSD-NON HVAC	23.70%	27.20%	23.80%	25.30%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Electric Impact Evaluation

RRsp Source: PY2020 Custom Electric Impact Evaluation

RRwp Source: PY2020 Custom Electric Impact Evaluation

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
VSD-NON HVAC	0.00	0.00	0.02	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
VSD-NON HVAC	0.36	0.01	0.01	0.65

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.42 / Gross kWh

Incentive: $0.35 / Gross kWh

Zero Loss Drain

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Compressed Air | **Measure Type:** Drain | **Measure Sub Type:** Zero Loss Drain

Program: C03a Energy Initiative

Measure Description

Drains remove water from a compressed air system. Zero loss condensate drains remove water from a compressed air system without venting any air, resulting in less air demand and consequently greater efficiency.

Baseline Description

Defined per project.

Savings Principle

The high efficiency case is the installation of a zero loss condensate drain on a single operating compressor rated <= 75 HP.

Savings Method

Calculated using site-specific inputs

Unit

Installed drain.

Savings Equation

Gross kWh = CFM_pipe × deltaCFM/CFM_pipe × deltakW/CFM × Hours

Gross kW = CFM_pipe × deltaCFM/CFM_pipe × deltakW/CFM

Where:

CFM_pipe = CFM capacity of piping: site-specific

0.049 deltaCFM/CFM_pipe = Average CFM saved per CFM of piping capacity

0.24386 deltakW/CFM = Average demand savings per CFM; Based on regional analysis assuming a typical timed drain settings discharge scenario.

Hours = Annual operating hours of the zero loss condensate drain: site-specific

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Zero Loss Drain	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Zero Loss Drain	13	1.00	1.00		1.00	1.00	1.00	0.80	0.54

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Zero Loss Drain	34.20%	28.90%	18.40%	18.40%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: KEMA (2016) Impact Evaluation of 2014 RI Prescriptive Compressed Air Installations

RRsp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

RRwp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

CFsp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

CFwp Source: DMI (2006). Impact Evaluation of 2004 Compressed Air Prescriptive Rebates. Prepared for National Grid. Results analyzed in RLW Analytics (2006). Sample Design and Impact Evaluation.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Zero Loss Drain	0.00	0.00	0.06	0

Annual $ Source: Tetra Tech (2012). Final Report – Commercial and Industrial Non-Energy Impacts Study. Prepared for the MA Program Administrators.

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Zero Loss Drain	0.15	0.00	0.00	0.86

NTG Source: PY2019 C&I Free Ridership/Spillover study

CUSTOM LIGHTING

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Lighting | **Measure Sub Type:** Lighting

Program: C03b Small Customers under 200kW

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
CUSTOM LIGHTING	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
CUSTOM LIGHTING	13	1.00	1.00		1.05	1.18	1.03	0.46	0.50

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
CUSTOM LIGHTING	30.30%	17.40%	34.30%	18.10%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

RRsp Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

RRwp Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

CFsp Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

CFwp Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
CUSTOM LIGHTING	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
CUSTOM LIGHTING	0.12	0.00	0.00	0.88

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.86 / kWh

Incentive: $0.60 / kWh

CUSTOM REFRIGERATION

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Refrigeration | **Measure Sub Type:** Refrigeration

Program: C03b Small Customers under 200kW

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom energy-efficiency project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
CUSTOM REFRIGERATION	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
CUSTOM REFRIGERATION	13	1.00	1.00		1.05	1.49	0.69	1.49	0.69

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
CUSTOM REFRIGERATION	39.30%	27.40%	19.60%	13.70%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: Impact Evaluation of 2017 Small Business Electric Installations (MA19C03-E-SBIMPCT) (P90)

RRsp Source: RLW Analytics (2007). Small Business Services Custom Measure Impact Evaluation. Prepared for National Grid.

RRwp Source: RLW Analytics (2007). Small Business Services Custom Measure Impact Evaluation. Prepared for National Grid.

CFsp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

CFwp Note: For all custom projects, gross summer and winter peak coincidence factors are custom-calculated based on project-specific information.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
CUSTOM REFRIGERATION	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
CUSTOM REFRIGERATION	0.29	0.00	0.00	0.71

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $1.72 / kWh

Incentive: $1.20 / kWh

Door Heater Control

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Refrigeration | **Measure Type:** Controls | **Measure Sub Type:** Door Heater Control

Program: C03b Small Customers under 200kW

Measure Description

The Installation of controls to reduce the run time of door and frame heaters for freezers and walk-in or reach-in coolers. The reduced heating also results in a reduced cooling load.

Baseline Description

The baseline efficiency case is a cooler or freezer door heater that operates 8,760 hours per year without any controls.

Savings Principle

The high efficiency case is a cooler or freezer door heater connected to a heater control system, which controls the door heaters by calculating the dew point of the store, and controlling the anti-sweat heater based on specific algorithms for freezer andcooler doors.

Savings Method

Calculated using site-specific inputs

Unit

Installed door heater controls on existing cooler/freezer.

Savings Equation

Gross kWh = kW_DoorHeater × %OFF × Hours

Gross kW = kW_DoorHeater × %OFF

Where:

kW_DoorHeater = Total demand of the door heater, calculated as Volts * Amps / 1000: site-specific

%OFF = Door heater Off time: 46% for freezer door heaters or 74% for cooler door heaters

Hours = Door heater annual run hours before controls

Hours: N/A.

Hours Note: Pre-retrofit hours are 8,760 hours per year. After controls are installed, the door heaters in freezers are on for an average 4,730.4 hours/year (46% off time) and the door heaters for coolers are on for an average 2,277.6 hours/year (74% off time) basedon National Resource Management field experience.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Door Heater Control	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Algorithm Inputs are based field experience and evaluation from National Resource Management. Supported by Select Energy (2004). Cooler Control Spreadsheet

Electric kW Note: Algorithm Inputs are based field experience and evaluation from National Resource Management. Supported by Select Energy (2004). Cooler Control Spreadsheet

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Door Heater Control	10	1.00	1.00		1.05	1.00	1.00	0.44	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Door Heater Control	39.30%	27.40%	19.60%	13.70%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: Impact Evaluation of 2017 Small Business Electric Installations (MA19C03-E-SBIMPCT) (P90)

RRsp Note: Realization rate is assumed 100% because savings are based on researched assumptions.

RRwp Note: Realization rate is assumed 100% because savings are based on researched assumptions.

CFsp Source: Cadmus, "Commercial Refrigeration Load shape Project Final Report", Northeast Energy Efficiency Partnership, Regional Evaluation, Measurement, and Verification Forum, Lexington, MA, 2015 (table 39)

CFwp Source: HEC, Inc. (1995). Analysis of Door Master Walk-In Cooler Anti-Sweat Door Heater Controls Installed at 10 Sites in MA. Prepared for NEPSCo; Table 9.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Door Heater Control	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Door Heater Control	0.29	0.00	0.00	0.71

NTG Source: PY2019 C&I Free Ridership/Spillover study

ECM Evaporator Fan Motors (Walk-in Coolers/Freezers)

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Refrigeration | **Measure Type:** Motors | **Measure Sub Type:** ECM

Program: C03b Small Customers under 200kW

Measure Description

Installation of electronically commutated motors (ECMs) in multi-deck and freestanding coolers and freezers, typically on the retail floor of convenience stores, liquor stores, and grocery stores.

Baseline Description

The baseline efficiency case is the existing case motor.

Savings Principle

The high efficiency case is the replacement of the existing case motor with an ECM.

Savings Method

Calculated using site-specific inputs

Unit

Installed electronically commutated motor for evaporator fans in existing cooler/freezer.

Savings Equation

Gross kWh = kW_Fan × LRF × Hours × (1 + RefrigEff × (Btu/hr per kW) / (Btu/hr per ton))

Gross kW = Gross kWh / Hours

Where:

kW_Fan = Power demand of evaporator fan calculated from equipment nameplate data and estimated 0.55 power factor/adjustment

LRF = Load reduction factor for motor replacement

Hours = Annual fan operating hours: site-specific

1.6 RefrigEff = Efficiency of typical refrigeration system (kW/ton); Estimate based on NRM field experience.

3413 Btu/hr per kW = Conversion factor

12,000 Btu/hrper ton = Conversion factor

Hours: N/A.

Hours Note: The annual operating hours are assumed to be 8,760 * (1-%OFF), where %OFF = 0 if the facility does not have evaporator fan controls or %OFF > 0 if the facility has evaporator fan controls.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
ECM Evaporator Fan Motors (Walk-in Coolers/Freezers)	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Algorithm Inputs are based field experience and evaluation from National Resource Management. Supported by Select Energy (2004). Cooler Control Spreadsheet

Electric kW Note: Algorithm Inputs are based field experience and evaluation from National Resource Management. Supported by Select Energy (2004). Cooler Control Spreadsheet

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
ECM Evaporator Fan Motors (Walk-in Coolers/Freezers)	15	1.00	0.00		1.05	1.00	1.00	0.87	0.51

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
ECM Evaporator Fan Motors (Walk-in Coolers/Freezers)	23.70%	27.20%	23.80%	25.30%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: Impact Evaluation of 2017 Small Business Electric Installations (MA19C03-E-SBIMPCT) (P90)

RRsp Source: RLW Analytics (2007). Small Business Services Custom Measure Impact Evaluation. Prepared for National Grid.

RRwp Source: RLW Analytics (2007). Small Business Services Custom Measure Impact Evaluation. Prepared for National Grid.

CFsp Source: RLW Analytics (2007). Impact Evaluation Analysis of the 2005 Custom SBS Program. Prepared for National Grid. Derivation based on site specific results from the study adjusted for current on peak hours.

CFwp Source: RLW Analytics (2007). Impact Evaluation Analysis of the 2005 Custom SBS Program. Prepared for National Grid. Derivation based on site specific results from the study adjusted for current on peak hours.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
ECM Evaporator Fan Motors (Walk-in Coolers/Freezers)	0.00	0.00	0.02	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
ECM Evaporator Fan Motors (Walk-in Coolers/Freezers)	0.29	0.00	0.00	0.71

NTG Source: PY2019 C&I Free Ridership/Spillover study

Fan Control

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Refrigeration | **Measure Type:** Controls | **Measure Sub Type:** Fan Control

Program: C03b Small Customers under 200kW

Measure Description

Installation of controls to modulate the evaporator fans based on temperature control. Energy savings include: fan energy savings from reduced fan operating hours, refrigeration energy savings from reduced waste heat, and compressor energy savings resulting from the electronic temperature control.

Baseline Description

The baseline efficiency case assumes evaporator fans that run 8760 annual hours with no temperature control.

Savings Principle

The high efficiency case is the use of an energy management system to control evaporator fan operation based on temperature.

Savings Method

Calculated using site-specific inputs

Unit

Installed controls on evaporator fans in existing cooler/freezer.

Savings Equation

Gross kWh = kW_Fan × %OFF × (Hours per year) × (1 + RefrigEff × (Btu/hr per kW) / (Btu/hr per ton)) + [kW_cp × Hours_cp + kW_fan × (Hours per year) × (1-%OFF)] × %SAVE

Gross kW = Gross kWh / Hours

Where:

kW_Fan = Power demand of evaporator fan calculatedfrom equipment nameplate data and estimated 0.55 power factor/adjustment

%OFF_heater = Door heater Off time: 46% for freezer door heaters or 74% for cooler door heaters

8760 Hours per year = Conversion factor

1.6 RefrigEff = Efficiency of typical refrigeration system (kW/ton); Estimate based on NRM field experience.

3,413 Btu/hr per kW = Conversion factor

12 kBtu/hr per ton = Conversion factor

kW_cp = Total power demand of compressor motor and condenser fan calculated from equipment nameplate data and estimated 0.85 power factor

Hours_cp = Equivalent annual full load hours of compressor operation; Estimate based on NRM field experience.

%OFF_evap = Percent of annual hours that the evaporator is turned off; Estimate based on NRM field experience.

%SAVE = Reduced run-time of compressor and evaporator due to electronic controls; Estimate based on NRM field experience.

Hours: 4,072.0.

Hours Note: The average annual operating hours are 4072 hours/year, based on National Resource Management field experience.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Fan Control	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Calculation assumptions based off of NRM field experience and data.

Electric kW Note: Calculation assumptions based off of NRM field experience and data.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Fan Control	10	1.00	1.00		1.05	1.00	1.00	0.23	0.84

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Fan Control	39.30%	27.40%	19.60%	13.70%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: Impact Evaluation of 2017 Small Business Electric Installations (MA19C03-E-SBIMPCT) (P90)

RRsp Source: HEC, Inc. (1996). Analysis of Savings from Walkiin Cooler Air Economizers and Evaporator Fan Controls. Prepared for NEPSco.

RRwp Source: HEC, Inc. (1996). Analysis of Savings from Walkiin Cooler Air Economizers and Evaporator Fan Controls. Prepared for NEPSco.

CFsp Source: HEC, Inc. (1995). Analysis of Door Master Walk-In Cooler Anti-Sweat Door Heater Controls Installed at 10 Sites in MA. Prepared for NEPSCo; Table 9.

CFwp Source: HEC, Inc. (1995). Analysis of Door Master Walk-In Cooler Anti-Sweat Door Heater Controls Installed at 10 Sites in MA. Prepared for NEPSCo; Table 9.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Fan Control	0.00	0.00	0.00	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Fan Control	0.29	0.00	0.00	0.71

NTG Source: PY2019 C&I Free Ridership/Spillover study

Faucet Aerator

Sector: C&I **Fuel:** Electric **Program Type:** Prescriptive

Measure Category: Water Heating **Measure Type:** Flow Control **Measure Sub Type:** Faucet Aerator

Program: C03b Small Customers under 200kW

Measure Description

The installation of a high efficiency water heating measures, such as faucet aerators, showerheads, spray valves, and salon nozzles.

Baseline Description

Standard efficiency DHW fixture.

Savings Principle

High efficiency / low flow DHW fixture.

Savings Method

Deemed

Unit

Installed salon aerator

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Faucet Aerator	387.4	0.0700	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Faucet Aerator	5	1.00	1.00		1.00	1.00	1.00	0.00	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Faucet Aerator	41.50%	31.40%	15.20%	11.90%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRsp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRwp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

CFsp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

CFwp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Faucet Aerator	5460.00	5460.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Faucet Aerator	0.29	0.00	0.00	0.71

NTG Source: PY2019 C&I Free Ridership/Spillover study

Freezer Door Heater Controls

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Refrigeration | **Measure Type:** Controls | **Measure Sub Type:** Door Heater Control

Program: C03b Small Customers under 200kW

Measure Description

The Installation of controls to reduce the run time of door and frame heaters for freezers and walk-in or reach-in coolers. The reduced heating also results in a reduced cooling load.

Baseline Description

The baseline efficiency case is a cooler or freezer door heater that operates 8,760 hours per year without any controls.

Savings Principle

The high efficiency case is a cooler or freezer door heater connected to a heater control system, which controls the door heaters by calculating the dew point of the store, and controlling the anti-sweat heater based on specific algorithms for freezer andcooler doors.

Savings Method

Calculated using site-specific inputs

Unit

Installed door heater controls on existing cooler/freezer.

Savings Equation

Gross kWh = kW_DoorHeater × %OFF × Hours

Gross kW = kW_DoorHeater × %OFF

Where:

kW_DoorHeater = Total demand of the door heater, calculated as Volts * Amps / 1000: site-specific

%OFF = Door heater Off time: 46% for freezer door heaters or 74% for cooler door heaters

Hours = Door heater annual run hours before controls

Hours: N/A.

Hours Note: Pre-retrofit hours are 8,760 hours per year. After controls are installed, the door heaters in freezers are on for an average 4,730.4 hours/year (46% off time) and the door heaters for coolers are on for an average 2,277.6 hours/year (74% off time) basedon National Resource Management field experience.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Freezer Door Heater Controls	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Algorithm Inputs are based field experience and evaluation from National Resource Management. Supported by Select Energy (2004). Cooler Control Spreadsheet

Electric kW Note: Algorithm Inputs are based field experience and evaluation from National Resource Management. Supported by Select Energy (2004). Cooler Control Spreadsheet

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Freezer Door Heater Controls	10	1.00	1.00		1.05	1.00	1.00	0.44	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Freezer Door Heater Controls	39.30%	27.40%	19.60%	13.70%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: Impact Evaluation of 2017 Small Business Electric Installations (MA19C03-E-SBIMPCT) (P90)

RRsp Note: Realization rate is assumed 100% because savings are based on researched assumptions.

RRwp Note: Realization rate is assumed 100% because savings are based on researched assumptions.

CFsp Source: Cadmus, "Commercial Refrigeration Load shape Project Final Report", Northeast Energy Efficiency Partnership, Regional Evaluation, Measurement, and Verification Forum, Lexington, MA, 2015 (table 39)

CFwp Source: HEC, Inc. (1995). Analysis of Door Master Walk-In Cooler Anti-Sweat Door Heater Controls Installed at 10 Sites in MA. Prepared for NEPSCo; Table 9.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Freezer Door Heater Controls	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Freezer Door Heater Controls	0.29	0.00	0.00	0.71

NTG Source: PY2019 C&I Free Ridership/Spillover study

LED Exit Signs

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Signage | **Measure Sub Type:** Exit Sign LED

Program: C03b Small Customers under 200kW

Measure Description

The installation of an LED exit sign.

Baseline Description

For retrofit installations, the baseline efficiency case is project-specific and is determined using actual fixture types and counts from the existing space. For lost opportunity installations, the baseline case is based on comparable code-compliant installations and standard practices.

Savings Principle

The high efficiency case is the installation of LED exit signs.

Savings Method

Calculated using site-specific inputs

Unit

Installed high-efficiency lighting project.

Savings Equation

Gross kWh = [SUM(QTY_base_i × Watts_base_i) - SUM(QTY_ee_j × Watts_ee_j)] / (Watts per kW) × Hours

Gross kW = [SUM(QTY_base_i × Watts_base_i) - SUM(QTY_ee_j × Watts_ee_j)] / (Watts per kW)

Where:

QTY_base_i = Quantity of baseline fixtures in location i

Watts_base_i = Connected wattage of baseline fixtures in location i

QTY_ee_j = Quantity of efficient fixtures in location j

Watts_ee_j = Connected wattage of efficient fixtures in location j

1,000 Watts per kW = Conversion factor

Hours = Lighting annual hours of operation: site-specific.

deltaMMBtu_Gas/kWh = Gross natural gas MMBtu reduction per gross kWh saved.

deltaMMBtu_Oil/kWh = Gross heating oil MMBtu reduction per gross kWh saved.

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
LED Exit Signs	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
LED Exit Signs	6	1.00	1.00		1.03	0.98	0.98	0.62	0.44

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
LED Exit Signs	30.30%	17.40%	34.30%	18.10%

Measure Life Source: RI C&I Lighting Market and AML Update Study

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: Summit Blue Consulting (2008). Large Commercial and Industrial Retrofit Program Impact Evaluation 2007. Prepared for National Grid.

RRsp Source: Summit Blue Consulting (2008). Large Commercial and Industrial Retrofit Program Impact Evaluation 2007. Prepared for National Grid.

RRwp Source: Summit Blue Consulting (2008). Large Commercial and Industrial Retrofit Program Impact Evaluation 2007. Prepared for National Grid.

CFsp Note: Coincidence Factors are assumed to be 1.0 since exit signs are on 8,760 hours a year.

CFwp Note: Coincidence Factors are assumed to be 1.0 since exit signs are on 8,760 hours a year.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
LED Exit Signs	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
LED Exit Signs	0.12	0.00	0.00	0.88

NTG Source: PY2019 C&I Free Ridership/Spillover study

LED EXTERIOR - HW

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Exterior | **Measure Sub Type:** LED Fixture

Program: C03b Small Customers under 200kW

Measure Description

The installation of hardwired ENERGY STAR® LED outdoor fixtures with pin-based bulbs. Savings for this measure are attributable to high efficiency outdoor lighting fixtures and are treated similarly to indoor fixtures.

Baseline Description

Lighting baseline mix.

Savings Principle

The high efficiency case is the installation of LED lighting fixtures.

Savings Method

Calculated using deemed inputs

Unit

Installed LED fixtures

Savings Equation

Gross kWh = Qty × deltakW × Hours

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

DeltakW = Deemed average kW reduction per unit.

Hours = Deemed average annual operating hours.

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
LED EXTERIOR - HW	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: DNV GL (2015) RI Small Business EE Program Prescriptive Lighting Study

Oil MMBtu Source: DNV GL (2015) RI Small Business EE Program Prescriptive Lighting Study

Propane MMBtu Source: DNV GL (2015) RI Small Business EE Program Prescriptive Lighting Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
LED EXTERIOR - HW	5	1.00	1.00		1.05	1.18	1.03	0.46	0.50

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
LED EXTERIOR - HW	30.30%	17.40%	34.30%	18.10%

Measure Life Source: RI C&I Lighting Market and AML Update Study

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

RRsp Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

RRwp Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

CFsp Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

CFwp Source: DNV GL (2015) RI Small Business EE Program Prescriptive Lighting Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
LED EXTERIOR - HW	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
LED EXTERIOR - HW	0.12	0.00	0.00	0.88

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.86 / kWh

Incentive: $0.60 / kWh

Lighting Systems

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Interior | **Measure Sub Type:** Efficient Lighting

Program: C03b Small Customers under 200kW

Measure Description

This measure promotes the installation of efficient lighting including, but not limited to, efficient fluorescent lamps, ballasts, and fixtures, solid state lighting, and efficient high intensity discharge (HID) lamps, ballasts, and fixtures.

Baseline Description

For retrofit installations, the baseline efficiency case is project-specific and is determined using actual fixture types and counts from the existing space. Existing fixture wattages are provided in the Table 4 of Appendix A. For lost opportunity installations, the baseline case is based on comparable code-compliant installations and standard practices.

Savings Principle

For both new construction and retrofit installations, the high efficiency case is project-specific and is

determined using actual fixture counts for the project and wattages found in Tables 3 and 5 in Appendix A.

Savings Method

Calculated using site-specific inputs

Unit

Installed high-efficiency lighting project.

Savings Equation

Gross kWh = [SUM(QTY_base_i × Watts_base_i) - SUM(QTY_ee_j × Watts_ee_j)] / (Watts per kW) × Hours

Gross kW = [SUM(QTY_base_i × Watts_base_i) - SUM(QTY_ee_j × Watts_ee_j)] / (Watts per kW)

Where:

QTY_base_i = Quantity of baseline fixtures in location i

Watts_base_i = Connected wattage of baseline fixtures in location i

QTY_ee_j = Quantity of efficient fixtures in location j

Watts_ee_j = Connected wattage of efficient fixtures in location j

1,000 Watts per kW = Conversion factor

Hours = Lighting annual hours of operation: site-specific.

deltaMMBtu_Gas/kWh = Gross natural gas MMBtu reduction per gross kWh saved.

deltaMMBtu_Oil/kWh = Gross heating oil MMBtu reduction per gross kWh saved.

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Lighting Systems	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Lighting Systems	6	1.00	1.00		1.05	1.18	1.03	0.46	0.50

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Lighting Systems	30.30%	17.40%	34.30%	18.10%

Measure Life Source: Nexus Market Research and RLW Analytics (2004). Impact Evaluation of the Massachusetts, Rhode Island, and Vermont 2003 Residential Lighting Programs.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

RRsp Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

RRwp Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

CFsp Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

CFwp Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Lighting Systems	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Lighting Systems	0.12	0.00	0.00	0.88

NTG Source: PY2019 C&I Free Ridership/Spillover study

Low-Flow Showerhead

Sector: C&I

Fuel: Electric

Program Type: Prescriptive

Measure Category: Water Heating

Measure Type: Flow Control

Measure Sub Type: Low Flow Showerhead

Program: C03b Small Customers under 200kW

Measure Description

Installation of a low flow showerhead with a flow rate of 1.5 GPM or less in a commercial setting with service water heated by electricity.

Baseline Description

The baseline efficiency case is a 2.5 GPM showerhead.

Savings Principle

The high efficiency case is a 1.5 GPM showerhead.

Savings Method

Deemed

Unit

Installed low-flow showerhead

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low-Flow Showerhead	1,185.0	0.2000	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low-Flow Showerhead	10	1.00	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low-Flow Showerhead	41.50%	31.40%	15.20%	11.90%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRsp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRwp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

CFsp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

CFwp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low-Flow Showerhead	7300.00	7300.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low-Flow Showerhead	0.29	0.00	0.00	0.71

NTG Source: PY2019 C&I Free Ridership/Spillover study

Novelty Cooler Shutoff

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Refrigeration | **Measure Type:** Controls | **Measure Sub Type:** Novelty Cooler Control

Program: C03b Small Customers under 200kW

Measure Description

Installation of controls to shut off a facility's novelty coolers for non-perishable goods based on pre-programmed store hours. Energy savings occur as coolers cycle off during facility unoccupied hours.

Baseline Description

The baseline efficiency case is the novelty coolers operating 8,760 hours per year.

Savings Principle

The high efficiency case is the novelty coolers operating fewer than 8,760 hours per year since they are controlled to cycle each night based on pre-programmed facility unoccupied hours.

Savings Method

Calculated using site-specific inputs

Unit

Installed controls on existing cooler/freezer.

Savings Equation

Gross kWh = kW_nc × DC_nc × HoursOff

Gross kW = 0

Where:

kW_nc = Power demand of novelty cooler calculated from equipment nameplate data and estimated 0.85 power factor.

DC_nc = Weighted average annual duty cycle; Estimate based on NRM field experience.

HoursOff = Potential hours off every night per year, estimated as one less than the number of hours the store is closed per day: site-specific.

Hours: N/A.

Hours Note: Energy and demand savings are based on the reduced operation hours of the cooler equipment. Hours reduced per day are estimated on a case-by-case basis, and are typically calculated as one less than the number of hours per day that the facility is closed;the baseline assumes equipment operated 24/7/365.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Novelty Cooler Shutoff	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Algorithm Inputs are based field experience and evaluation from National Resource Management. Supported by Select Energy (2004). Cooler Control Spreadsheet

Electric kW Note: Algorithm Inputs are based field experience and evaluation from National Resource Management. Supported by Select Energy (2004). Cooler Control Spreadsheet

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Novelty Cooler Shutoff	10	1.00	1.00		1.05	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Novelty Cooler Shutoff	39.30%	27.40%	19.60%	13.70%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: Impact Evaluation of 2017 Small Business Electric Installations (MA19C03-E-SBIMPCT) (P90)

RRsp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRwp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

CFsp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

CFwp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Novelty Cooler Shutoff	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Novelty Cooler Shutoff	0.29	0.00	0.00	0.71

NTG Source: PY2019 C&I Free Ridership/Spillover study

OCCUPANCY SENSORS

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Lighting | **Measure Type:** Controls | **Measure Sub Type:** Occupancy Sensor

Program: C03b Small Customers under 200kW

Measure Description

This measure promotes the installation of lighting controls in both lost-opportunity and retrofit applications. Promoted technologies include occupancy sensors and daylight dimming controls.

Baseline Description

The baseline efficiency case assumes no controls (retrofit) or code-compliant controls (new construction).

Savings Principle

The high efficiency case involves lighting fixtures connected to controls that reduce the pre-retrofit or baseline hours of operation.

Savings Method

Calculated using site-specific inputs

Unit

Installed lighting controls project.

Savings Equation

Gross kWh = SUM[QTY_i × Watts_i × (Hours_base_i - Hours_ee_i)] / (Watts per kW)

Gross kW = SUM(QTY_i × Watts_i) / (Watts per kW)

Where:

QTY_i = Quantity in controlled fixtures in location i

Watts_i = Connected wattage of controlled fixtures in location i

Hours_base_i = Total annual hours that the connected lighting in location i operated without controls (for retrofit installations) or would have operated with code-compliance controls (for new construction installations).

Hours_ee_i = Total annual hours that the connected lighting in location i operates with the lighting controls implemented.

1,000 Watts per kW = Conversion factor

deltaMMBtu_Gas/kWh = Gross natural gas MMBtu reduction per gross kWh saved.

deltaMMBtu_Oil/kWh = Gross heating oil MMBtu reduction per gross kWh saved.

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
OCCUPANCY SENSORS	Calc	Calc	0.00031 / kWh	0.00	0.00	0.00060 / kWh	0.00

Gas Heat MMBtu Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

Oil MMBtu Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
OCCUPANCY SENSORS	9	1.00	1.00		1.00	0.94	0.94	0.35	0.28

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
OCCUPANCY SENSORS	30.30%	17.40%	34.30%	18.10%

Measure Life Source: Dan Mellinger's Lighting Control Measure Life Memo

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: KEMA (2013). Impact Evaluation of 2011 Rhode Island Prescriptive Lighting Installations

RRsp Source: KEMA (2013). Impact Evaluation of 2011 Rhode Island Prescriptive Lighting Installations

RRwp Source: KEMA (2013). Impact Evaluation of 2011 Rhode Island Prescriptive Lighting Installations

CFsp Source: KEMA (2013). Impact Evaluation of 2011 Rhode Island Prescriptive Lighting Installations

CFwp Source: KEMA (2013). Impact Evaluation of 2011 Rhode Island Prescriptive Lighting Installations

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
OCCUPANCY SENSORS	0.00	0.00	0.08	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
OCCUPANCY SENSORS	0.12	0.00	0.00	0.88

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.86 / kWh

Incentive: $0.60 / kWh

PHOTOCELLS

Sector: C&I **Fuel:** Electric **Program Type:** Custom

Measure Category: Lighting **Measure Type:** Controls **Measure Sub Type:** Photocells

Program: C03b Small Customers under 200kW

Measure Description

Installing a photocell to control lighting.

Baseline Description

Lighting that runs 24/7.

Savings Principle

Installed photocell controls lighting.

Savings Method

Calculated using site-specific inputs

Unit

Installed lighting controls project.

Savings Equation

Gross kWh = SUM[QTY_i × Watts_i × (Hours_base_i - Hours_ee_i)] / (Watts per kW)

Gross kW = SUM(QTY_i × Watts_i) / (Watts per kW)

Where:

QTY_i = Quantity in controlled fixtures in location i

Watts_i = Connected wattage of controlled fixtures in location i

Hours_base_i = Total annual hours that the connected lighting in location i operated without controls (for retrofit installations) or would have operated with code-compliance controls (for new construction installations).

Hours_ee_i = Total annual hours that the connected lighting in location i operates with the lighting controls implemented.

1,000 Watts per kW = Conversion factor

deltaMMBtu_Gas/kWh = Gross natural gas MMBtu reduction per gross kWh saved.

deltaMMBtu_Oil/kWh = Gross heating oil MMBtu reduction per gross kWh saved.

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
PHOTOCELLS	Calc	Calc	0.00031 / kWh	0.00	0.00	0.00060 / kWh	0.00

Gas Heat MMBtu Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

Oil MMBtu Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
PHOTOCELLS	9	1.00	1.00		1.00	0.94	0.94	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
PHOTOCELLS	30.30%	17.40%	34.30%	18.10%

Measure Life Source: Dan Mellinger's Lighting Control Measure Life Memo

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: KEMA (2013). Impact Evaluation of 2011 Rhode Island Prescriptive Lighting Installations

RRsp Source: KEMA (2013). Impact Evaluation of 2011 Rhode Island Prescriptive Lighting Installations

RRwp Source: KEMA (2013). Impact Evaluation of 2011 Rhode Island Prescriptive Lighting Installations

CFsp Source: KEMA (2013). Impact Evaluation of 2011 Rhode Island Prescriptive Lighting Installations

CFwp Source: KEMA (2013). Impact Evaluation of 2011 Rhode Island Prescriptive Lighting Installations

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
PHOTOCELLS	0.00	0.00	0.08	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
PHOTOCELLS	0.12	0.00	0.00	0.88

NTG Source: PY2019 C&I Free Ridership/Spillover study

Pre-Rinse Spray Valve

Sector: C&I

Fuel: Electric

Program Type: Prescriptive

Measure Category: Water Heating

Measure Type: Flow Control

Measure Sub Type: Low Flow Spray Valve

Program: C03b Small Customers under 200kW

Measure Description

Retrofitting existing standard spray nozzles in locations where service water is supplied by an electric hot water heater with new low flow pre-rinse spray nozzles with an average flow rate of 1.6 GPM.

Baseline Description

Standard spray valve.

Savings Principle

The high efficiency case is a low flow pre-rinse spray valve with an average flow rate of 1.6 GPM.

Savings Method

Deemed

Unit

Installed pre-rinse spray valve.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Pre-Rinse Spray Valve	2,598.0	0.6786	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Pre-Rinse Spray Valve	8	1.00	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Pre-Rinse Spray Valve	41.50%	31.40%	15.20%	11.90%

Measure Life Source: DNV GL (2014)Impact Evaluation of Massachusetts Prescriptive Gas Pre-Rinse Spray Valve Measure

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRsp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRwp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

CFsp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

CFwp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Pre-Rinse Spray Valve	6410.00	6410.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Pre-Rinse Spray Valve	0.29	0.00	0.00	0.71

NTG Source: PY2019 C&I Free Ridership/Spillover study

PROGRAMMABLE THERMOSTATS

Sector: C&I **Fuel:** Electric **Program Type:** Custom

Measure Category: HVAC **Measure Type:** Controls **Measure Sub Type:** Thermostat

Program: C03b Small Customers under 200kW

Measure Description

Installation of programmable thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule to meet occupancy needs and minimize redundant HVAC operation.

Baseline Description

The baseline efficiency case is an HVAC system providing space heating or cooling without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system that has a programmable thermostat or wi-fi programmable thermostat installed.

Savings Method

Deemed

Unit

Installed thermostat

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
PROGRAMMABLE THERMOSTATS	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
PROGRAMMABLE THERMOSTATS	8	1.00	1.00		1.05	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
PROGRAMMABLE THERMOSTATS	39.30%	27.40%	19.60%	13.70%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: Impact Evaluation of 2017 Small Business Electric Installations (MA19C03-E-SBIMPCT) (P90)

RRsp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRwp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

CFsp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

CFwp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
PROGRAMMABLE THERMOSTATS	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
PROGRAMMABLE THERMOSTATS	0.29	0.00	0.00	0.71

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.66 / kWh

Incentive: $0.46 / kWh

Refrigerated Case LED

Sector: C&I | **Fuel:** Electric | **Program Type:** Custom

Measure Category: Refrigeration | **Measure Type:** Refrigeration Lighting | **Measure Sub Type:** Refrigerator Case LED

Program: C03b Small Customers under 200kW

Measure Description

Installation of LED lighting in freezer and/or cooler cases. The LED lighting consumes less energy, and results in less waste heat which reduces the cooling/freezing load.

Baseline Description

The baseline efficiency case is the existing lighting fixtures in the cooler or freezer cases.

Savings Principle

The high efficiency case is the installation of LED lighting fixtures on the cooler or freezer cases, replacing the existing lighting fixtures.

Savings Method

Calculated using site-specific inputs

Unit

Completed lighting project.

Savings Equation

Gross kWh = [SUM(QTY_base × Watts_base × Hours_base) - SUM(QTY_ee × kW_ee × Hours_ee)] × (1 + EffRefrig × (Btu/hr per kW) / (Btu/hr per ton))

Gross kW = Gross kWh / Hours_ee

Where:

QTY_base = Quantity of baseline lighting fixtures in cooler/freezer case

Watts_base = Connected wattage of baseline lighting fixtures in cooler/freezer case

Hours_base = Annual operating hours of baseline lighting fixtures in cooler/freezer case

QTY_ee = Quantity of efficient lighting fixtures in cooler/freezer case

Watts_ee =Connected wattage of efficient lighting fixtures in cooler/freezer case

Hours_ee = Annual operating hours of efficient lighting fixtures in cooler/freezer case

1.9 RefrigEff = Efficiency of typical refrigeration system (kW/ton); Estimate based on NRM field experience.

3413 Btu/hr per kW = Conversion factor

12,000 Btu/hr per ton = Conversion factor

Hours_ee = Annual operating hours of efficient lighting fixtures in cooler/freezer case

Hours: 8,760.0.

Hours Note: The average annual operating hours are 8760 hours/year.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Refrigerated Case LED	Calc	Calc	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Refrigerated Case LED	6	1.00	1.00		1.05	1.07	1.15	0.99	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Refrigerated Case LED	30.30%	17.40%	34.30%	18.10%

Measure Life Source: RI C&I Lighting Market and AML Update Study

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: Impact Evaluation of 2017 Small Business Electric Installations (MA19C03-E-SBIMPCT) (P90)

RRsp Source: RLW Analytics (2007). Small Business Services Custom Measure Impact Evaluation. Prepared for National Grid.

RRwp Source: RLW Analytics (2007). Small Business Services Custom Measure Impact Evaluation. Prepared for National Grid.

CFsp Note: Coincidence factors set to 1.00 since gross kW is the average kW reduction during operation.

CFwp Note: Coincidence factors set to 1.00 since gross kW is the average kW reduction during operation.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Refrigerated Case LED	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Refrigerated Case LED	0.29	0.00	0.00	0.71

NTG Source: PY2019 C&I Free Ridership/Spillover study

TIMECLOCKS

Sector: C&I **Fuel:** Electric **Program Type:** Custom

Measure Category: Lighting **Measure Type:** Controls **Measure Sub Type:** Timeclocks

Program: C03b Small Customers under 200kW

Measure Description

Installing a timeclock to control lighting.

Baseline Description

Lighting that runs unnecessarily.

Savings Principle

Installed timeclock controls lighting.

Savings Method

Calculated using site-specific inputs

Unit

Installed lighting controls project.

Savings Equation

Gross kWh = SUM[QTY_i × Watts_i × (Hours_base_i - Hours_ee_i)] / (Watts per kW)

Gross kW = SUM(QTY_i × Watts_i) / (Watts per kW)

Where:

QTY_i = Quantity in controlled fixtures in location i

Watts_i = Connected wattage of controlled fixtures in location i

Hours_base_i = Total annual hours that the connected lighting in location i operated without controls (for retrofit installations) or would have operated with code-compliance controls (for new construction installations).

Hours_ee_i = Total annual hours that the connected lighting in location i operates with the lighting controls implemented.

1,000 Watts per kW = Conversion factor

deltaMMBtu_Gas/kWh = Gross natural gas MMBtu reduction per gross kWh saved.

deltaMMBtu_Oil/kWh = Gross heating oil MMBtu reduction per gross kWh saved.

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
TIMECLOCKS	Calc	Calc	0.00031 / kWh	0.00	0.00	0.00060 / kWh	0.00

Gas Heat MMBtu Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

Oil MMBtu Source: Impact Evaluation of PY2016 RI C&I Small Business Initiative: Phase I

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
TIMECLOCKS	9	1.00	1.00		1.00	0.94	0.94	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
TIMECLOCKS	30.30%	17.40%	34.30%	18.10%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: KEMA (2013). Impact Evaluation of 2011 Rhode Island Prescriptive Lighting Installations

RRsp Source: KEMA (2013). Impact Evaluation of 2011 Rhode Island Prescriptive Lighting Installations

RRwp Source: KEMA (2013). Impact Evaluation of 2011 Rhode Island Prescriptive Lighting Installations

CFsp Source: KEMA (2013). Impact Evaluation of 2011 Rhode Island Prescriptive Lighting Installations

CFwp Source: KEMA (2013). Impact Evaluation of 2011 Rhode Island Prescriptive Lighting Installations

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
TIMECLOCKS	0.00	0.00	0.08	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per kWh

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
TIMECLOCKS	0.12	0.00	0.00	0.88

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.74 / kWh

Incentive: $0.52 / kWh

VENDING MACHINES

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Refrigeration | **Measure Type:** Controls | **Measure Sub Type:** Vending Miser

Program: C03b Small Customers under 200kW

Measure Description

Controls significantly reduce the energy consumption of vending machines lighting and refrigeration systems by powering down these systems during periods of inactivity. This measure does not apply to ENERGY STAR® qualified vending machines, as they already have built-in controls.

Baseline Description

The baseline efficiency case is a standard efficiency vending machine, or glass front refrigerated cooler without a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Savings Principle

The high efficiency case is a standard efficiency vending machine, or glass front refrigerated cooler with a control system capable of powering down lighting and refrigeration systems during periods of inactivity.

Savings Method

Deemed

Unit

Installed vending miser.

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: 8,760.0.

Hours Note: It is assumed that the connected equipment operates 24 hours per day, 7 days per week for a total annual operating hours of 8,760.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
VENDING MACHINES	1,612.0	0.1840	0.00	0.00	0.00	0.00	0.00

Electric kWh Source: USA Technologies Energy Management Product Sheets (2006). Accessed on 09/01/2009.

Electric kW Source: USA Technologies Energy Management Product Sheets (2006). Accessed on 09/01/2009.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
VENDING MACHINES	5	1.00	1.00		1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
VENDING MACHINES	39.30%	27.40%	19.60%	13.70%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRsp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRwp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

CFsp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

CFwp Note: Coincidence Factors are set to zero since demand savings typically occur during off-peak hours.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
VENDING MACHINES	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
VENDING MACHINES	0.29	0.00	0.00	0.71

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.41 / kWh

Incentive: $0.29 / kWh

Peak Shaving DR

Sector: C&I **Fuel:** Electric **Program Type:** Custom

Measure Category: Whole Building **Measure Type:** Demand Response **Measure Sub Type:** Whole Building

Program: Commercial ConnectedSolutions

Measure Description

This is a peak shaving program offering where during National Grid called events C&I customers will curtail as much load as possible and receive an incentive for shifting loads to off peak times.

Baseline Description

No action taken for these customers

Savings Principle

Peak Demand savings are achieved by customers shifting load from peak times to off peak times.

Savings Method

Custom

Unit

Per demand response event

Savings Equation

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Peak Shaving DR	0	0	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Peak Shaving DR	1	1.00	1.00			0.80		1.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Peak Shaving DR	0.00%	0.00%	0.00%	0.00%

SPF Note: Savings persistence is assumed to be 100%.

RRsp Source: Cross-State C&I Active Demand Reduction Initiative Summer 2019 Evaluation Report

RRsp Note: National Grid is using the MA National Grid specific prospective RR.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Peak Shaving DR	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Peak Shaving DR	0.00	0.00	0.00	1.00

TRC: $40.00 / Summer Net kW Savings

Incentive: $40.00 / Summer Net kW Savings

Solar Inverters

Sector: C&I | **Fuel:** Electric | **Program Type:** Prescriptive

Measure Category: Controls | **Measure Type:** Demand Response | **Measure Sub Type:** Controls

Program: Commercial ConnectedSolutions

Measure Description

This is a solar inverter program where during called events the solar inverter is to inject or absorb reactive power depending on local voltage and generation conditions.

Baseline Description

No action taken for these customers

Savings Principle

Peak Demand savings are achieved by customers shifting load from peak times to off peak times.

Savings Method

Deemed

Unit

Installation of solar inverter

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Where:

Qty = Total number of units.

Delta kWh = Deemed average annual kWh reduction per unit.

Delta kW = Deemed average kW reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Solar Inverters	17,857.0	1.9600	0.00	0.00	0.00	0.00	0.00

Electric kWh Note: Based on RI 2022 EE plan value.

Electric kW Note: Based on RI 2022 EE plan value.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Solar Inverters	1	1.00	1.00					1.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Solar Inverters	30.50%	36.10%	15.20%	18.30%

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Solar Inverters	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Solar Inverters	0.00	0.00	0.00	1.00

Air Sealing

Sector: C&I	**Fuel:** Gas	**Program Type:** Custom
Measure Category: Building Shell	**Measure Type:** Air Sealing	**Measure Sub Type:** Air Sealing/Infiltration

Program: C&I Multifamily

Measure Description

Thermal shell air leaks are sealed through strategic use and location of air-tight materials.

Baseline Description

The baseline efficiency case is the existing building before the air sealing measure is implemented. The baseline building is characterized by the existing CFM50 measurement (CFM50PRE) for single family homes, or the existing air changes per hour (ACHPRE).

Savings Principle

The high efficiency case is the existing building after the air sealing measure is implemented. The high efficiency building is characterized by the new CFM50 measurement for single family homes (CFM50POST), or the new air changes per hour (ACHPOST) for multi-family facilities, which is measured after the air sealing measure is implemented.

Savings Method

Calculated using site-specific inputs

Unit

Completed air sealing project.

Savings Equation

Gross MMBtu Gas = (CFM50_pre - CFM50_post) / LBL × HDD × (Hours per Day) × (Minutes per Hour) × (Btu/ft3-°F) × CorrectionFactor / SeasonalEff / (Btu per MMBtu)

Where:

CFM50_pre = CFM50 measurement before air sealing

CFM50_post = CFM50 measurement after air sealing (cu.ft./min)

LBL = LBL factor - This factor is determined as the product of the N-factor and a Height Correction Factor according to BPI Protocol

4644 HDD = Heating degree days (deg. F-day); This value is an average BASE 60 Annual Heating Degree Day value for weather stations in Rhode Island and southeastern Massachusetts based on NOAA 30-year data. http://www.ncdc.noaa.gov

24 Hours per Day = Conversion factor

60 Minutes per Hour = Conversion factor

0.018 Btu/ft3-°F = Heat capacity of 1 cubic foot of air at 70 °F

1 CorrectionFactor = Correction factor determined by auditor (e.g. for seasonal homes): Default

0.7 SeasonalEff = Heating system seasonal efficiency factor determined by auditor for homes heated with natural gas: Default

1,000,000 Btuper MMBtu = Conversion factor

Hours: 4,644.0.

Hours Source: NOAA Weather data: An average BASE 60 Annual Heating Degree Day value for weather stations in Rhode Island and southeastern Massachusetts based on NOAA 30-year data.

Hours Note: Heating hours are characterized by the heating degree days for the facility, 4644.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Air Sealing	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for the Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Air Sealing	20	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Air Sealing	0.00%	0.00%	0.00%	0.00%

Measure Life Source: 'ComEd Effective Useful Life Research Report', May 2018

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Energy realization rate is 100% because deemed savings are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Air Sealing	0.00	0.00	19.35	135.83

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Annual $ Note: NEI per participant / treated unit

One-time $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Air Sealing	0.33	0.01	0.00	0.68

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: MF Bundled costs (see Participant listing)

Incentive: MF Bundled costs (see Participant listing)

Custom

Sector: C&I **Fuel:** Gas **Program Type:** Custom

Measure Category: Custom **Measure Type:** Custom **Measure Sub Type:** Custom

Program: C&I Multifamily

Measure Description

Vendors install a variety of measures at multifamily facilities. Measures include custom non-lighting C&I multifamily measures.

Baseline Description

For retrofit projects, the baseline efficiency case is the same as the existing, or pre-retrofit, case for the

Savings Principle

The high efficiency scenario is specific to the facility and may include one or more energy efficiency

Savings Method

Calc

Unit

Completed custom project

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Hours Note: The annual hours of operation are site specific and will be determined on a case by case basis.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Custom	Calc	Calc	Calc	Calc	0.00	Calc	Calc

Gas Heat MMBtu Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Custom	multi	1.00	1.00	0.99	0.99			Custom	Custom

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Custom	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Custom	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Custom	0.00	0.00	0.00	1.00

TRC: MF Bundled costs (see Participant listing)

Incentive: MF Bundled costs (see Participant listing)

Demand Circulator

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Demand Circulator

Program: C&I Multifamily

Measure Description

Installation of a demand controller on a re-circulation loop.

Baseline Description

Full time operation of re-circ pump.

Savings Principle

The re-circulation pump is controlled by a demand signal or timer to reduce operating hours when no hot water usage occurs.

Savings Method

Calc

Unit

Installed recirculation controller

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Demand Circulator	0	0	Calc	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Demand Circulator	15	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Demand Circulator	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Demand Circulator	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Demand Circulator	0.00	0.00	0.00	1.00

TRC: MF Bundled costs (see Participant listing)

Incentive: MF Bundled costs (see Participant listing)

Duct Sealing

Sector: C&I **Fuel:** Gas **Program Type:** Custom

Measure Category: HVAC **Measure Type:** Ducting **Measure Sub Type:** Duct Sealing

Program: C&I Multifamily

Measure Description

Ducts are sealed by reconnecting disconnected duct joints and sealing gaps or seams with mastic and fiber-mesh tape as appropriate.

Baseline Description

The baseline efficiency case is the existing facility or equipment prior to the implementation of duct sealing.

Savings Principle

The baseline efficiency case is the existing facility or equipment after the implementation of duct sealing.

Savings Method

Calc

Unit

Installation of duct sealing

Savings Equation

MMBtu = Annualheatingconsumption x %SAVE x (1/1000000)

Where:

AnnualHeatingConsumption = The total annual heating consumption for the facility (Btu)

%SAVE = Average reduction in energy consumption.

1/1,000,000 = Conversion from Btu to MMBtu

Savings Factors for Multifamily Duct Sealing

Measure Type %SAVE158

Savings Factors for Multifamily Duct Sealing

Surface Area < 50 SQFT 7%

Surface Area > 50 SQFT and < 200 SQFT 3%

Surface Area > 200 SQFT 1%

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Duct Sealing	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Calculated by RISE Engineering according to algorithms found in The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Duct Sealing	20	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Duct Sealing	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Duct Sealing	0.00	0.00	0.23	0

Annual $ Source: NMR Group, Inc., Tetra Tech (2011). Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation. Prepared for Massachusetts Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Duct Sealing	0.33	0.01	0.00	0.68

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: MF Bundled costs (see Participant listing)

Incentive: MF Bundled costs (see Participant listing)

Faucet Aerator

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Faucet Aerator

Program: C&I Multifamily

Measure Description

Installation of a faucet aerator with a flow rate of 1.5 GPM or less on an existing faucet with high flow in a commercial setting with service water heated by natural gas.

Baseline Description

The baseline efficiency case is a 2.2 GPM faucet.

Savings Principle

The high efficiency case is a faucet with 1.5 GPM or less aerator installed.

Savings Method

Deemed

Unit

Installed faucet aerator.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Faucet Aerator	0	0	0.00	0.20	0.00	0.00	0.00

Gas DHW MMBtu Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Faucet Aerator	7	0.90	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Faucet Aerator	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Federal Energy Management Program (2010). Energy Cost Calculator for Faucets and Showerheads. Accessed on 10/12/2011.

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Faucet Aerator	359.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Faucet Aerator	0.08	0.01	0.00	0.93

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: MF Bundled costs (see Participant listing)

Incentive: MF Bundled costs (see Participant listing)

Low Flow Showerhead with Thermo Control (Ladybug Gas DHW)

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: C&I Multifamily

Measure Description

A showerhead with a control that limits flow once water is heated.

Baseline Description

The baseline case is a showerhead with a flow of 2.5 gallons per minute, or for the case of the adapter, a low flow showerhead with flow of 1.5 gpm or less.

Savings Principle

The high efficiency is a low-flow showerhead with a control that limits flow once the water is heated.

Savings Method

Deemed

Unit

Installed low-flow showerhead

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low Flow Showerhead with Thermo Control (Ladybug Gas DHW)	0	0	0.00	0.34	0.00	0.00	0.00

Gas DHW MMBtu Source: National Grid (2014). Review of ShowerStart evolve.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low Flow Showerhead with Thermo Control (Ladybug Gas DHW)	15	1.00	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low Flow Showerhead with Thermo Control (Ladybug Gas DHW)	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

Measure Life Note: Massachusetts Common Assumption

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: National Grid assumption based on regional PA working groups.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low Flow Showerhead with Thermo Control (Ladybug Gas DHW)	558.00	0.00	0	0

Water/Sewer Source: National Grid (2014). Review of ShowerStart evolve.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low Flow Showerhead with Thermo Control (Ladybug Gas DHW)	0.08	0.01	0.00	0.93

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: MF Bundled costs (see Participant listing)

Incentive: MF Bundled costs (see Participant listing)

Low Flow Showerhead with Thermo Control (Roadrunner Gas DHW)

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: C&I Multifamily

Measure Description

A showerhead with a control that limits flow once water is heated.

Baseline Description

The baseline case is a showerhead with a flow of 2.5 gallons per minute, or for the case of the adapter, a low flow showerhead with flow of 1.5 gpm or less.

Savings Principle

The high efficiency is a low-flow showerhead with a control that limits flow once the water is heated.

Savings Method

Deemed

Unit

Installed low-flow showerhead

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low Flow Showerhead with Thermo Control (Roadrunner Gas DHW)	0	0	0.00	1.60	0.00	0.00	0.00

Gas DHW MMBtu Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low Flow Showerhead with Thermo Control (Roadrunner Gas DHW)	15	0.90	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low Flow Showerhead with Thermo Control (Roadrunner Gas DHW)	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

Measure Life Note: Massachusetts Common Assumption

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: National Grid assumption based on regional PA working groups.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low Flow Showerhead with Thermo Control (Roadrunner Gas DHW)	2254.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low Flow Showerhead with Thermo Control (Roadrunner Gas DHW)	0.08	0.01	0.00	0.93

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: MF Bundled costs (see Participant listing)

Incentive: MF Bundled costs (see Participant listing)

Low-Flow Showerhead

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: C&I Multifamily

Measure Description

Installation of a low flow showerhead with a flow rate of 1.5 GPM or less in a commercial setting with service water heated by natural gas.

Baseline Description

The baseline efficiency case is a 2.5 GPM showerhead.

Savings Principle

The high efficiency case is a 1.5 GPM showerhead.

Savings Method

Deemed

Unit

Installed low-flow showerhead

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low-Flow Showerhead	0	0	0.00	1.30	0.00	0.00	0.00

Gas DHW MMBtu Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low-Flow Showerhead	15	0.90	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low-Flow Showerhead	0.00%	0.00%	0.00%	0.00%

Measure Life Source: MA Comprehensive TRM Review MA19R17-B-TRM DRAFT

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low-Flow Showerhead	1786.00	0.00	0.58	0

Water/Sewer Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low-Flow Showerhead	0.08	0.01	0.00	0.93

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: MF Bundled costs (see Participant listing)

Incentive: MF Bundled costs (see Participant listing)

MF Shell Insulation

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Building Shell | **Measure Type:** Insulation | **Measure Sub Type:** Shell

Program: C&I Multifamily

Measure Description

Insulation upgrades are applied in existing multifamily facilities.

Baseline Description

The baseline efficiency case is characterized by the total R-value of the existing attic, basement or sidewall (Rexisit). This is calculated as the R-value of the existing insulation, estimated by the program contractor, plus the R-value of the ceiling, floor, or wall (for all projects: RCEILING = 3.36; RFLOOR = 6.16; RWALL = 6.65).

Savings Principle

The high efficiency case is characterized by the total R-value of the attic after the installation of additional attic, basement or sidewall insulation. This is calculated as the sum of the existing R-value (RBASE) plus the R-value of the added insulation(RADD).

Savings Method

Calculated using site-specific inputs

Unit

Completed insulation project.

Savings Equation

MMBTUannual = (((1/Rexist)-(1/Rnew)) x HDD x 24 x Area) / (1,000,000) X Nheat

kWhannual = MMBtuannaul x 293.1

kW = kWhannual x kW/kWh heating

Where:

Rexist = Existing effective R-value (R-ExistingInsulation + R-Assembly), ft2-°F/Btuh

Rnew = New total effective R-value (R-ProposedMeasure + R-ExistingInsulation + R-Assembly), ft2-°F/Btuh

Area = Square footage of insulated area

ηheat = Efficiency of the heating system (AFUE or COP)

293.1 = Conversion constant (1MMBtu = 293.1 kWh)

24 = Conversion for hours per day

HDD = Heating Degree Days; dependent on location, see table below

1,000,000 = Conversion from Btu to MMBtu

kW/kWh heating = Average annual kW reduction per kWh reduction: 0.00050 kW/kWh

Hours: 4,644.0.

Hours Source: NOAA Weather data: An average BASE 60 Annual Heating Degree Day value for weather stations in Rhode Island and southeastern Massachusetts based on NOAA 30-year data.

Hours Note: Heating hours are characterized by the heating degree days for the facility, 4644.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
MF Shell Insulation	Calc	Calc	Calc	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for the Massachusetts Program Administrators.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
MF Shell Insulation	25	1.00	1.00	1.00	1.00			0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
MF Shell Insulation	7.00%	4.00%	47.00%	42.00%

Measure Life Source: The Cadmus Group (2012). Massachusetts 2011 Residential Retrofit Multifamily Program Impact Analysis. Prepared for the Massachusetts Program Administrators.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
MF Shell Insulation	0.00	0.00	47.31	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
MF Shell Insulation	0.33	0.01	0.00	0.68

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: MF Bundled costs (see Participant listing)

Incentive: MF Bundled costs (see Participant listing)

Participant

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: Participant **Measure Type:** Participant **Measure Sub Type:** C&I MF

Program: C&I Multifamily

Measure Description

This row identifies a participant for tracking and cost purposes.

Baseline Description

Savings Principle

Savings Method

Unit

Per participant

Savings Equation

N/A

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Participant	0	0	0.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Participant	1	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Participant	0.00%	0.00%	0.00%	0.00%

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Participant	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Participant	0.00	0.00	0.00	1.00

TRC: $415.00 / participant

Incentive: $378.00 / participant

Pipe Wrap (Water Heating)

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: Water Heating **Measure Type:** Insulation **Measure Sub Type:** Pipe Insulation

Program: C&I Multifamily

Measure Description

Installation of DHW pipe wraps.

Baseline Description

The baseline efficiency case is the existing hot water equipment.

Savings Principle

The high efficiency case includes pipe wrap.

Savings Method

Deemed

Unit

Installation of a DHW pipe wrap

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Pipe Wrap (Water Heating)	0	0	0.00	0.15	0.00	0.00	0.00

Gas DHW MMBtu Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Gas DHW MMBtu Note: 3 feet per piece

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Pipe Wrap (Water Heating)	15	0.90	1.00	1.00	1.00				

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Pipe Wrap (Water Heating)	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. (2007). Measure Life Report: Residential and Commercial/Industrial Lighting and HVAC Measures. Prepared for The New England State Program Working Group.

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Pipe Wrap (Water Heating)	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Pipe Wrap (Water Heating)	0.08	0.01	0.00	0.93

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: MF Bundled costs (see Participant listing)

Incentive: MF Bundled costs (see Participant listing)

Programmable Thermostat

Sector: C&I **Fuel:** Gas **Program Type:** Custom

Measure Category: HVAC **Measure Type:** Controls **Measure Sub Type:** Thermostat

Program: C&I Multifamily

Measure Description

Installation of a programmable thermostat which gives the ability to adjust heating or air-conditioning operating times according to a pre-set schedule.

Baseline Description

For the installation of a programmable thermostat, the baseline efficiency case is an HVAC system using natural gas to provide space heating without a programmable thermostat. For the installation of a wi-fi programmable thermostat, the baseline efficiency case is an HVAC system using natural gas to provide space heating with a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system that has a programmable thermostat or wi-fi programmable thermostat installed.

Savings Method

Deemed

Unit

Installation of programmable thermostat

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Programmable Thermostat	29.0	0.0461	1.50	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Gas Heat MMBtu Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Programmable Thermostat	13	0.95	1.00	1.00	1.00			0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Programmable Thermostat	7.00%	4.00%	47.00%	42.00%

Measure Life Source: Guidehouse (2021). Comprehensive TRM Review.

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Programmable Thermostat	0.00	0.00	14.35	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Programmable Thermostat	0.48	0.01	0.00	0.53

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: MF Bundled costs (see Participant listing)

Incentive: MF Bundled costs (see Participant listing)

Wi-Fi Programmable Thermostat (Controls Gas Heat Only)

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: C&I Multifamily

Measure Description

A communicating thermostat which allows remote set point adjustment and control via remote application. System requires an outdoor air temperature algorithm in the control logic to operate heating and cooling systems Primary Energy Impact: Natural Gas.

Baseline Description

For the installation of a programmable thermostat, the baseline efficiency case is an HVAC system using natural gas to provide space heating without a programmable thermostat. For the installation of a wi-fi programmable thermostat, the baseline efficiency case is an HVAC system using natural gas to provide space heating with a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system that has a programmable thermostat or wi-fi programmable thermostat installed.

Savings Method

Deemed

Unit

Installation of WiFi programmable thermostat

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Wi-Fi Programmable Thermostat (Controls Gas Heat Only)	31.0	0.0493	2.30	0.00	0.00	0.00	0.00

Electric kWh Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Electric kW Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Gas Heat MMBtu Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Wi-Fi Programmable Thermostat (Controls Gas Heat Only)	15	0.95	1.00	1.00	1.00			0.35	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Wi-Fi Programmable Thermostat (Controls Gas Heat Only)	7.00%	4.00%	47.00%	42.00%

Measure Life Source: Environmental Protection Agency (2010). Life Cycle Cost Estimate for Programmable Thermostats. Accessed on 10/12/2011.

ISR Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Navigant Consulting (2018). Baseline Loadshape Study

CFwp Source: Navigant Consulting (2018). Baseline Loadshape Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Wi-Fi Programmable Thermostat (Controls Gas Heat Only)	0.00	0.00	14.35	0

Annual $ Source: NMR Group and DNV GL (2018). TXC 29 Market-Rate Rental Property NEI Study (Phase 1). Prepared for the MA Program Administrators.

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Wi-Fi Programmable Thermostat (Controls Gas Heat Only)	0.48	0.01	0.00	0.53

NTG Source: RI-20-RX-EWMFImpact – Impact Evaluation of EnergyWise Multifamily Program

TRC: MF Bundled costs (see Participant listing)

Incentive: MF Bundled costs (see Participant listing)

Boiler Reset Control

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Boiler Control

Program: C&I Small Business Direct Install

Measure Description

Boiler reset controls are devices that automatically control boiler water temperature based on outdoor temperature using a software program.

Baseline Description

Fixed boiler water temperature.

Savings Principle

The high efficiency case is a boiler with reset controls.

Savings Method

Deemed

Unit

Installed boiler reset control

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Boiler Reset Control	0	0.0000	35.50	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Boiler Reset Control	15	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Boiler Reset Control	0.00%	0.00%	0.00%	0.00%

Measure Life Source: ACEEE (2006). Emerging Technologies Report: Advanced Boiler Controls. Prepared for ACEEE.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Boiler Reset Control	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Boiler Reset Control	0.11	0.02	0.00	0.90

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $7.14 / Gross therm

Incentive: $5.00 / Gross therm

DEMAND CIRCULATOR

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: Water Heating **Measure Type:** Controls **Measure Sub Type:** Recirc

Program: C&I Small Business Direct Install

Measure Description

Installation of a demand controller on a re-circulation loop.

Baseline Description

Full time operation of re-circ pump.

Savings Principle

The re-circulation pump is controlled by a demand signal or timer to reduce operating hours when no hot water usage occurs.

Savings Method

Deemed

Unit

Installed recirculation controller

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
DEMAND CIRCULATOR	96.0	0.1600	195.00	19.50	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
DEMAND CIRCULATOR	15	1.00	1.00	1.00				0.58	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
DEMAND CIRCULATOR	42.00%	31.00%	15.00%	12.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

CFsp Source: P72 Prescriptive C&I Loadshapes of Savings

CFwp Source: P72 Prescriptive C&I Loadshapes of Savings

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
DEMAND CIRCULATOR	0.00	0.00	0.08	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
DEMAND CIRCULATOR	0.11	0.02	0.00	0.90

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.29 / Gross therm

Incentive: $3.00 / Gross therm

Faucet Aerator

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: Water Heating **Measure Type:** Flow Control **Measure Sub Type:** Faucet Aerator

Program: C&I Small Business Direct Install

Measure Description

Installation of a faucet aerator with a flow rate of 1.5 GPM or less on an existing faucet with high flow in a commercial setting with service water heated by natural gas.

Baseline Description

The baseline efficiency case is a 2.2 GPM faucet.

Savings Principle

The high efficiency case is a faucet with 1.5 GPM or less aerator installed.

Savings Method

Deemed

Unit

Installed faucet aerator.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: 130.0.

Hours Source: Federal Energy Management Program (2010). Energy Cost Calculator for Faucets and Showerheads. Accessed on 10/12/2011.

Hours Note: The calculator used to determine the deemed savings uses a default operation of 30 minuts/day, 260 days/year. Not applicable for Multifamily applications.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Faucet Aerator	0	0.0000	0.00	1.70	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Faucet Aerator	5	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Faucet Aerator	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Federal Energy Management Program (2010). Energy Cost Calculator for Faucets and Showerheads. Accessed on 10/12/2011.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Faucet Aerator	5460.00	5460.00	0.08	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Faucet Aerator	0.11	0.02	0.00	0.90

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.29 / Gross therm

Incentive: $3.00 / Gross therm

High-Pressure Steam Trap HVAC

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: HVAC **Measure Type:** Steam Traps **Measure Sub Type:** Steam Trap

Program: C&I Small Business Direct Install

Measure Description

The repair or replacement of malfunctioning steam traps in systems with an operating pressure greater than 15 psig.

Baseline Description

The baseline efficiency case is a failed steam trap.

Savings Principle

The high efficiency case is a repaired or replaced steam trap.

Savings Method

Deemed

Unit

Repaired or replaced steam trap.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
High-Pressure Steam Trap HVAC	0	0.0000	35.60	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: ERS Two-Tier Steam Trap Savings Study; April 26, 2018

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
High-Pressure Steam Trap HVAC	6	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
High-Pressure Steam Trap HVAC	0.00%	0.00%	0.00%	0.00%

Measure Life Source: DNV GL MA 2013,2017 Prescriptive Gas Impact Evaluation: Steam Trap Evaulation Phase 1 & 2

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
High-Pressure Steam Trap HVAC	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
High-Pressure Steam Trap HVAC	0.11	0.02	0.00	0.90

NTG Source: PY2019 C&I Free Ridership/Spillover study

INS_DUCT_SF

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: HVAC **Measure Type:** Insulation **Measure Sub Type:** Duct

Program: C&I Small Business Direct Install

Measure Description

The installation of duct insulation and air sealing.

Baseline Description

Un-insulated ductwork with air leaks

Savings Principle

Insulating and air sealing ductwork reduces heat loss / gain, thereby saving energy.

Savings Method

Deemed

Unit

SF of installed insulation

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
INS_DUCT_SF	Calc	Calc	0.13	0.00	0.00	0.00	0.00

Gas Heat MMBtu Note: National Grid Staff Estimate (2010) MA SBS-DI Duct Sealing and Insulation Scenario and Deemed Savings.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
INS_DUCT_SF	20	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
INS_DUCT_SF	0.00%	0.00%	0.00%	0.00%

Measure Life Note: National Grid Staff Estimate (2010) MA SBS-DI Duct Sealing and Insulation Scenario and Deemed Savings.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
INS_DUCT_SF	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
INS_DUCT_SF	0.11	0.02	0.00	0.90

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $12.86 / Gross therm

Incentive: $9.00 / Gross therm

Insulation Pipe Diameter 1.5in H2O

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Water Heater Insulation | **Measure Sub Type:** Insulation

Program: C&I Small Business Direct Install

Measure Description

Install insulation on hot water piping located in non-conditioned spaces.

Baseline Description

Existing uninsulated pipe.

Savings Principle

The high efficiency condition is hot water piping in unconditional space with insulation installed.

Savings Method

Deemed

Unit

Installed LF of pipe insulation

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Insulation Pipe Diameter 1.5in H2O	0	0.0000	0.21	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Insulation Pipe Diameter 1.5in H2O	15	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Insulation Pipe Diameter 1.5in H2O	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Insulation Pipe Diameter 1.5in H2O	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Insulation Pipe Diameter 1.5in H2O	0.11	0.02	0.00	0.90

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.29 / Gross therm

Incentive: $3.00 / Gross therm

Insulation Pipe Diameter 1.5in Steam

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Water Heater Insulation | **Measure Sub Type:** Insulation

Program: C&I Small Business Direct Install

Measure Description

Install insulation on steam piping located in non-conditioned spaces.

Baseline Description

Existing uninsulated pipe.

Savings Principle

The high efficiency condition is steam piping in unconditional space with insulation installed.

Savings Method

Deemed

Unit

Installed LF of pipe insulation

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Insulation Pipe Diameter 1.5in Steam	0	0.0000	0.21	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Insulation Pipe Diameter 1.5in Steam	15	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Insulation Pipe Diameter 1.5in Steam	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Insulation Pipe Diameter 1.5in Steam	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Insulation Pipe Diameter 1.5in Steam	0.11	0.02	0.00	0.90

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.29 / Gross therm

Incentive: $3.00 / Gross therm

Insulation Pipe Diameter 2in H2O

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Water Heater Insulation | **Measure Sub Type:** Insulation

Program: C&I Small Business Direct Install

Measure Description

Install insulation on hot water piping located in non-conditioned spaces.

Baseline Description

Existing uninsulated pipe.

Savings Principle

The high efficiency condition is hot water piping in unconditional space with insulation installed.

Savings Method

Deemed

Unit

Installed LF of pipe insulation

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Insulation Pipe Diameter 2in H2O	0	0.0000	0.36	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Insulation Pipe Diameter 2in H2O	15	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Insulation Pipe Diameter 2in H2O	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Insulation Pipe Diameter 2in H2O	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Insulation Pipe Diameter 2in H2O	0.11	0.02	0.00	0.90

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.29 / Gross therm

Incentive: $3.00 / Gross therm

Insulation Pipe Diameter 2in Steam

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Water Heater Insulation | **Measure Sub Type:** Insulation

Program: C&I Small Business Direct Install

Measure Description

Install insulation on steam piping located in non-conditioned spaces.

Baseline Description

Existing uninsulated pipe.

Savings Principle

The high efficiency condition is steam piping in unconditional space with insulation installed.

Savings Method

Deemed

Unit

Installed LF of pipe insulation

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Insulation Pipe Diameter 2in Steam	0	0.0000	0.37	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Insulation Pipe Diameter 2in Steam	15	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Insulation Pipe Diameter 2in Steam	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Insulation Pipe Diameter 2in Steam	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Insulation Pipe Diameter 2in Steam	0.11	0.02	0.00	0.90

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.29 / Gross therm

Incentive: $3.00 / Gross therm

Low-Flow Showerhead

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: C&I Small Business Direct Install

Measure Description

Installation of a low flow showerhead with a flow rate of 1.5 GPM or less in a commercial setting with service water heated by natural gas.

Baseline Description

The baseline efficiency case is a 2.5 GPM showerhead.

Savings Principle

The high efficiency case is a 1.5 GPM showerhead.

Savings Method

Deemed

Unit

Installed low-flow showerhead

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: 121.6.

Hours Source: Federal Energy Management Program (2010). Energy Cost Calculator for Faucets and Showerheads. Accessed on 10/12/2011.

Hours Note: The calculator used to determine the deemed savings uses a default operation of 20 minutes/day, 365 days/year. Not applicable for Multifamily applications.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low-Flow Showerhead	0	0.0000	0.00	5.20	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low-Flow Showerhead	10	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low-Flow Showerhead	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low-Flow Showerhead	7300.00	7300.00	0.08	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low-Flow Showerhead	0.11	0.02	0.00	0.90

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $3.57 / Gross therm

Incentive: $2.50 / Gross therm

Low-Pressure Steam Trap HVAC

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Steam Traps | **Measure Sub Type:** Steam Trap

Program: C&I Small Business Direct Install

Measure Description

The repair or replacement of malfunctioning steam traps in systems with an operating pressure less than or equal to 15 psig.

Baseline Description

The baseline efficiency case is a failed steam trap.

Savings Principle

The high efficiency case is a repaired or replaced steam trap.

Savings Method

Deemed

Unit

Repaired or replaced steam trap.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low-Pressure Steam Trap HVAC	0	0.0000	8.40	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: ERS Two-Tier Steam Trap Savings Study; April 26, 2018

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low-Pressure Steam Trap HVAC	6	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low-Pressure Steam Trap HVAC	0.00%	0.00%	0.00%	0.00%

Measure Life Source: DNV GL MA 2013,2017 Prescriptive Gas Impact Evaluation: Steam Trap Evaulation Phase 1 & 2

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low-Pressure Steam Trap HVAC	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low-Pressure Steam Trap HVAC	0.11	0.02	0.00	0.90

NTG Source: PY2019 C&I Free Ridership/Spillover study

Pre-Rinse Spray Valve

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Spray Valve

Program: C&I Small Business Direct Install

Measure Description

Retrofitting existing standard spray nozzles in locations where service water is supplied by natural gas fired hot water heater with new low flow pre-rinse spray nozzles with an average flow rate of 1.6 GPM.

Baseline Description

The baseline efficiency case is a standard efficiency spray valve.

Savings Principle

The high efficiency case is a low flow pre-rinse spray valve with an average flow rate of 1.6 GPM.

Savings Method

Deemed

Unit

Installed pre-rinse spray valve.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Pre-Rinse Spray Valve	0	0.0000	0.00	11.40	0.00	0.00	0.00

Gas DHW MMBtu Source: DNV GL (2014)Impact Evaluation of Massachusetts Prescriptive Gas Pre-Rinse Spray Valve Measure

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Pre-Rinse Spray Valve	8	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Pre-Rinse Spray Valve	0.00%	0.00%	0.00%	0.00%

Measure Life Source: DNV GL (2014)Impact Evaluation of Massachusetts Prescriptive Gas Pre-Rinse Spray Valve Measure

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Pre-Rinse Spray Valve	6410.00	6410.00	0.08	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Pre-Rinse Spray Valve	0.11	0.02	0.00	0.90

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $3.57 / Gross therm

Incentive: $2.50 / Gross therm

Programmable Thermostat

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: C&I Small Business Direct Install

Measure Description

Installation of programmable thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule to meet occupancy needs and minimize redundant HVAC operation.

Baseline Description

The baseline efficiency case is an HVAC system using natural gas to provide space heating without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system using natural gas to provide space heating with a programmable thermostat installed.

Savings Method

Deemed

Unit

Installed programmable thermostat

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Programmable Thermostat	0	0.0000	3.20	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: DNV-GL, MA45 Prescriptive Programmable Thermostats, March 2017

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Programmable Thermostat	15	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Programmable Thermostat	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Environmental Protection Agency (2010). Life Cycle Cost Estimate for Programmable Thermostats. Accessed on 10/12/2011.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Programmable Thermostat	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Programmable Thermostat	0.11	0.02	0.00	0.90

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $5.71 / Gross therm

Incentive: $4.00 / Gross therm

Salon Nozzle

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Spray Valve

Program: C&I Small Business Direct Install

Measure Description

The installation of a high efficiency salon nozzle.

Baseline Description

Standard salon nozzle.

Savings Principle

An efficient salon nozzle.

Savings Method

Deemed

Unit

Installed salon nozzle

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Salon Nozzle	0	0.0000	0.00	20.40	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Salon Nozzle	5	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Salon Nozzle	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Energy & Resource Solutions (2005). Measure Life Study. Prepared for The Massachusetts Joint Utilities.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Salon Nozzle	28639.00	28639.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Salon Nozzle	0.11	0.02	0.00	0.90

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $2.86 / Gross therm

Incentive: $2.00 / Gross therm

WiFi Tstat - Cooling and Heating

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: HVAC **Measure Type:** Controls **Measure Sub Type:** WiFi T-stat

Program: C&I Small Business Direct Install

Measure Description

A communicating thermostat which allows remote set point adjustment and control via remote application. System requires an outdoor air temperature algorithm in the control logic to operate heating and cooling systems.

Baseline Description

The baseline efficiency case is an HVAC system with either a manual or a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system that has a Wi-Fi thermostat installed.

Savings Method

Deemed

Unit

Installation of WiFi programmable thermostat

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
WiFi Tstat - Cooling and Heating	0	0.0000	6.60	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
WiFi Tstat - Cooling and Heating	15	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
WiFi Tstat - Cooling and Heating	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Environmental Protection Agency (2010). Life Cycle Cost Estimate for Programmable Thermostats. Accessed on 10/12/2011.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
WiFi Tstat - Cooling and Heating	0.00	0.00	0.59	0.00

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-ClOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
WiFi Tstat - Cooling and Heating	0.11	0.02	0.00	0.90

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.00 / Gross therm

Incentive: $2.80 / Gross therm

WiFi Tstat - Heating Only

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** WiFi T-stat

Program: C&I Small Business Direct Install

Measure Description

A communicating thermostat which allows remote set point adjustment and control via remote application. System requires an outdoor air temperature algorithm in the control logic to operate heating and cooling systems Primary Energy Impact: Natural Gas.

Baseline Description

The baseline efficiency case is an HVAC system with either a manual or a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system that has a Wi-Fi thermostat installed.

Savings Method

Deemed

Unit

Installation of WiFi programmable thermostat

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
WiFi Tstat - Heating Only	0	0.0000	6.60	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
WiFi Tstat - Heating Only	15	1.00	1.00	1.00		1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
WiFi Tstat - Heating Only	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Environmental Protection Agency (2010). Life Cycle Cost Estimate for Programmable Thermostats. Accessed on 10/12/2011.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
WiFi Tstat - Heating Only	0.00	0.00	0.59	0.00

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
WiFi Tstat - Heating Only	0.11	0.02	0.00	0.90

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.00 / Gross therm

Incentive: $2.80 / Gross therm

BOILER RESET 1 STAGE

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Boiler Control

Program: Large C&I Retrofit

Measure Description

Boiler reset controls are devices that improve the efficiency of an existing boiler system by modulating the hot water temperature set point. Reset controls automatically control boiler water temperature based on outdoor temperature using a software program; load controls sense the thermal demand of the heating system and resets the water temperature based on the demand.

Baseline Description

The baseline efficiency case is a boiler without reset or load controls.

Savings Principle

The efficient case is a boiler with reset or load controls, which reset the supply water temperature based on outdoor temperatures and/or building load.

Savings Method

Deemed

Unit

Installation of boiler reset control on existing boiler

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
BOILER RESET 1 STAGE	0	0.0000	35.50	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
BOILER RESET 1 STAGE	15	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
BOILER RESET 1 STAGE	0.00%	0.00%	0.00%	0.00%

Measure Life Source: ACEEE (2006). Emerging Technologies Report: Advanced Boiler Controls. Prepared for ACEEE.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
BOILER RESET 1 STAGE	0.00	0.00	0.59	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
BOILER RESET 1 STAGE	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Boiler Reset Control (Multi-Stage)

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Boiler Control

Program: Large C&I Retrofit

Measure Description

Boiler reset controls are devices that automatically control boiler water temperature based on outdoor temperature using a software program.

Baseline Description

The baseline efficiency case is a boiler without reset controls.

Savings Principle

The high efficiency case is a boiler with reset controls.

Savings Method

Deemed

Unit

Boiler reset control installed on existing boiler.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Boiler Reset Control (Multi-Stage)	0	0.0000	35.50	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Environmental Protection Agency (2011). Savings Calculator for ENERGY STAR Qualified Commercial Kitchen Equipment: Steam Cooker Calcs.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Boiler Reset Control (Multi-Stage)	15	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Boiler Reset Control (Multi-Stage)	0.00%	0.00%	0.00%	0.00%

Measure Life Source: ACEEE (2006). Emerging Technologies Report: Advanced Boiler Controls. Prepared for ACEEE.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Boiler Reset Control (Multi-Stage)	0.00	0.00	0.59	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Boiler Reset Control (Multi-Stage)	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Boiler, Condensing Blend

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Boiler | **Measure Sub Type:** Blend

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Boiler, Condensing Blend	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Boiler, Condensing Blend	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Boiler, Condensing Blend	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Boiler, Condensing Blend	Calc	Calc	0.05	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Boiler, Condensing Blend	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Boiler, Condensing Heating

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Boiler | **Measure Sub Type:** Heating

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Boiler, Condensing Heating	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Boiler, Condensing Heating	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Boiler, Condensing Heating	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Boiler, Condensing Heating	Calc	Calc	-0.07	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Boiler, Condensing Heating	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Boiler, Condensing Year-Round

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Boiler | **Measure Sub Type:** Year-round

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Boiler, Condensing Year-Round	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Boiler, Condensing Year-Round	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Boiler, Condensing Year-Round	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Boiler, Condensing Year-Round	Calc	Calc	0.35	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Boiler, Condensing Year-Round	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Boiler, Non-Condensing Blend

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Boiler | **Measure Sub Type:** Blend

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Boiler, Non-Condensing Blend	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Boiler, Non-Condensing Blend	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Boiler, Non-Condensing Blend	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Boiler, Non-Condensing Blend	Calc	Calc	-0.05	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Boiler, Non-Condensing Blend	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Boiler, Non-Condensing Heating

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Boiler | **Measure Sub Type:** Heating

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Boiler, Non-Condensing Heating	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Boiler, Non-Condensing Heating	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Boiler, Non-Condensing Heating	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Boiler, Non-Condensing Heating	Calc	Calc	-0.07	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Boiler, Non-Condensing Heating	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Boiler, Non-Condensing Year-Round

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Boiler | **Measure Sub Type:** Year-round

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Boiler, Non-Condensing Year-Round	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Boiler, Non-Condensing Year-Round	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Boiler, Non-Condensing Year-Round	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Boiler, Non-Condensing Year-Round	Calc	Calc	0.35	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Boiler, Non-Condensing Year-Round	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Building Operator Certification

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Whole Building | **Measure Type:** BOC Training | **Measure Sub Type:** Certification

Program: Large C&I Retrofit

Measure Description

The Building Operator Certification (BOC) class improves operators' ability to optimize / minimize gas and electricity use in buildings.

Baseline Description

The base case is a building operator without specific training on efficient use of gas and electricity in buildings.

Savings Principle

The high efficiency case is a building operator attending a class on improving the efficiency of gas and electricity use in buildings.

Savings Method

Deemed

Unit

MMBTU/SF/BOC completion

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Building Operator Certification	0	0.0000	0.00	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Navigant Consulting (2015). Comprehensive Review of Non-Residential Training and Education Programs, with a Focus on Building Operator Certification. Prepared for the Massachusetts PAs and EEAC

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Building Operator Certification	5	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Building Operator Certification	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Navigant Consulting (2015). Comprehensive Review of Non-Residential Training and Education Programs, with a Focus on Building Operator Certification. Prepared for the Massachusetts PAs and EEAC

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Building Operator Certification	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Building Operator Certification	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Building Operator Certification + Capital Improvements

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Whole Building | **Measure Type:** BOC Training | **Measure Sub Type:** Certification + capital improvements

Program: Large C&I Retrofit

Measure Description

The Building Operator Certification (BOC) class improves operators' ability to optimize / minimize gas and electricity use in buildings.

Baseline Description

The base case is a building operator without specific training on efficient use of gas and electricity in buildings.

Savings Principle

The high efficiency case is a building operator attending a class on improving the efficiency of gas and electricity use in buildings, as well as capital investments in EE projects.

Savings Method

Deemed

Unit

MMBTU/SF/BOC completion

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Building Operator Certification + Capital Improvements	0	0.0000	0.00	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: Navigant Consulting (2015). Comprehensive Review of Non-Residential Training and Education Programs, with a Focus on Building Operator Certification. Prepared for the Massachusetts PAs and EEAC

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Building Operator Certification + Capital Improvements	5	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Building Operator Certification + Capital Improvements	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Navigant Consulting (2015). Comprehensive Review of Non-Residential Training and Education Programs, with a Focus on Building Operator Certification. Prepared for the Massachusetts PAs and EEAC

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Building Operator Certification + Capital Improvements	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Building Operator Certification + Capital Improvements	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Building Shell

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Whole Building | **Measure Sub Type:** Heating

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Building Shell	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Building Shell	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Building Shell	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Building Shell	Calc	Calc	0.32	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Building Shell	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Comprehensive Design - CD

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Whole Building | **Measure Sub Type:** Heating

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Comprehensive Design - CD	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Comprehensive Design - CD	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Comprehensive Design - CD	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Comprehensive Design - CD	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Comprehensive Design - CD	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Comprehensive Design - CDA

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Whole Building | **Measure Sub Type:** Heating

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Comprehensive Design - CDA	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Comprehensive Design - CDA	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Comprehensive Design - CDA	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Comprehensive Design - CDA	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Comprehensive Design - CDA	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Comprehensive Retrofit

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Whole Building | **Measure Sub Type:** Heating

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Comprehensive Retrofit	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Comprehensive Retrofit	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Comprehensive Retrofit	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Comprehensive Retrofit	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Comprehensive Retrofit	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Custom Other

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Whole Building | **Measure Sub Type:** Whole Building

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Custom Other	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Custom Other	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Custom Other	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Custom Other	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Custom Other	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $5.00 / Gross therm

Incentive: $2.50 / Gross therm

Custom: SEM

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** SEM | **Measure Sub Type:** SEM

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Custom: SEM	Calc	Calc	Calc	0.00	0.00	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Custom: SEM	3	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Custom: SEM	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Custom: SEM	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Custom: SEM	0.00	0.00	0.00	1.00

Domestic Hot Water

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** DHW | **Measure Sub Type:** Year-round

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Domestic Hot Water	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Domestic Hot Water	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Domestic Hot Water	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Domestic Hot Water	Calc	Calc	0.35	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Domestic Hot Water	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Energy Management System (Building)

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** HVAC | **Measure Sub Type:** Heating

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Energy Management System (Building)	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Energy Management System (Building)	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Energy Management System (Building)	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Energy Management System (Building)	Calc	Calc	0.04	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Energy Management System (Building)	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $6.00 / Gross therm

Incentive: $3.00 / Gross therm

ERV - Fixed Plate UPSTR

Sector: C&I

Fuel: Gas

Program Type: Prescriptive

Measure Category: HVAC

Measure Type: Upstream

Measure Sub Type: Energy Recovery Ventilator

Program: Large C&I Retrofit

Measure Description

Installation of a gas fired heated air system with ERV ≥60% total effectiveness.

Baseline Description

The baseline is a gas fired heating system without ERV.

Savings Principle

The high efficiency case is a gas fired heated air system with ERV ≥60% total effectiveness.

Savings Method

Calc

Unit

Installed gas fired heating system with ERV.

Savings Equation

Unit Peak kWh Savings =((4.5*CFM*deltah_cooling)*(1/EER*ERV_E)/1000 - (CFM*PD/6356/Eff_Motor/Eff_fan*0.746*2)*CF

Unit Dth Savings per Year = (4.5*CFM*deltah_heating)/η*((HDD65*24)/(T_indoor-T_design))*(Hours/24))/1,000,000*ERV_E*0.75

Where:

CF = Coincidence Factor = 0.9

CFM=Outside Air Flow in cubic feet per minute

EER = Provided by customer. If SEER provided, SEER*0.875.

Eff_Fan = Efficiency of fan. Provided by customer. If value not provided assume 0.705.

Eff_Motor = Efficiency of motor. Provided bycustomer. If value not provided assume 0.855.

ERV_E = Total Energy Effectiveness of ERV. Provided by manufacturer/customer. If values not provided, fixedplate - sensible heat only = 0.355, fixed plate - sensible&latent heat =0.577, fixedplate - unk = 0.466, rotarywheel = 0.647, heatpipe = 0.31.

Hours = Hours of operation, per day. Provided by customer. If none provided, assume 12.

HDD65 = Heating Degree Days:northern - design cooling h = 32.4 Btu/lbm; cooling return = 28.36 Btu/lbm, HSS65 = 9,833 degF-days; incremental cost = $1.32/CFM

PD = Additional pressure drop through heat exchanger, inches of water column. Provided by customer. If value is not provided, fixedplate - sensible heat only = 0.00035, fixedplate-sensible&latentheat = 0.00074, fixedplate-unk = 0.00055, rotarywheel = 0.00012, heatpipe=0.00011.

T_indoor = Customer provided indoor heating conditioned space temperature in degreesF

η= Efficiency of heating equipment. Assume 0.8 unless different efficiency is provided by customer.

deltah_cooling = difference in enthalpies (btu/lb) between the design day cooling enthalpy and exhaust air heat exchanger inlet enthalpy.

deltah_heating = difference in enthalpies (btu/lb) between the exhaust air heat exchanger inlet enthalpy and design day heatingenthalpy.

1,000 = conversion factor of watts per kWh

1,000,000 = conversion factor for BTU to Dth

0.75 = factor to account for prevention of freezing of condensate. Control strategies incorporate full air flow by-pass or other strategies that reduce the number of hours of operation at lower temperatures, multiply ERE_E by 0.75 if not adjusted by manufacturer or customer.

See MN TRM 3.1 for more detail.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
ERV - Fixed Plate UPSTR	0.0	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Note: It is assumed cooling savings are equal to the increased fan energy usage.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
ERV - Fixed Plate UPSTR	20	1.00	1.00		1.00	1.00	1.00	0.47	0.22

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
ERV - Fixed Plate UPSTR	25.30%	29.30%	24.30%	21.00%

Measure Life Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
ERV - Fixed Plate UPSTR	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
ERV - Fixed Plate UPSTR	0.33	0.12	0.01	0.80

NTG Source: MA 2022 TRM

TRC: $8.28 / Gross therm

Incentive: $1.38 / Gross therm

ERV - Rotary Wheel UPSTR

Sector: C&I

Fuel: Gas

Program Type: Prescriptive

Measure Category: HVAC

Measure Type: Upstream

Measure Sub Type: Energy Recovery Ventilator

Program: Large C&I Retrofit

Measure Description

Installation of a gas fired heated air system with ERV ≥60% total effectiveness.

Baseline Description

The baseline is a gas fired heating system without ERV.

Savings Principle

The high efficiency case is a gas fired heated air system with ERV ≥60% total effectiveness.

Savings Method

Calc

Unit

Installed gas fired heating system with ERV.

Savings Equation

Unit Peak kWh Savings =((4.5*CFM*deltah_cooling)*(1/EER*ERV_E)/1000 - (CFM*PD/6356/Eff_Motor/Eff_fan*0.746*2)*CF

Unit Dth Savings per Year = (4.5*CFM*deltah_heating)/η*((HDD65*24)/(T_indoor-T_design))*(Hours/24))/1,000,000*ERV_E*0.75

Where:

CF = Coincidence Factor = 0.9

CFM=Outside Air Flow in cubic feet per minute

EER = Provided by customer. If SEER provided, SEER*0.875.

Eff_Fan = Efficiency of fan. Provided by customer. If value not provided assume 0.705.

Eff_Motor = Efficiency of motor. Provided bycustomer. If value not provided assume 0.855.

ERV_E = Total Energy Effectiveness of ERV. Provided by manufacturer/customer. If values not provided, fixedplate - sensible heat only = 0.355, fixed plate - sensible&latent heat =0.577, fixedplate - unk = 0.466, rotarywheel = 0.647, heatpipe = 0.31.

Hours = Hours of operation, per day. Provided by customer. If none provided, assume 12.

HDD65 = Heating Degree Days:northern - design cooling h = 32.4 Btu/lbm; cooling return = 28.36 Btu/lbm, HSS65 = 9,833 degF-days; incremental cost = $1.32/CFM

PD = Additional pressure drop through heat exchanger, inches of water column. Provided by customer. If value is not provided, fixedplate - sensible heat only = 0.00035, fixedplate-sensible&latentheat = 0.00074, fixedplate-unk = 0.00055, rotarywheel = 0.00012, heatpipe=0.00011.

T_indoor = Customer provided indoor heating conditioned space temperature in degreesF

η= Efficiency of heating equipment. Assume 0.8 unless different efficiency is provided by customer.

deltah_cooling = difference in enthalpies (btu/lb) between the design day cooling enthalpy and exhaust air heat exchanger inlet enthalpy.

deltah_heating = difference in enthalpies (btu/lb) between the exhaust air heat exchanger inlet enthalpy and design day heatingenthalpy.

1,000 = conversion factor of watts per kWh

1,000,000 = conversion factor for BTU to Dth

0.75 = factor to account for prevention of freezing of condensate. Control strategies incorporate full air flow by-pass or other strategies that reduce the number of hours of operation at lower temperatures, multiply ERE_E by 0.75 if not adjusted by manufacturer or customer.

See MN TRM 3.1 for more detail.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
ERV - Rotary Wheel UPSTR	0.0	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Note: It is assumed cooling savings are equal to the increased fan energy usage.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
ERV - Rotary Wheel UPSTR	20	1.00	1.00		1.00	1.00	1.00	0.47	0.22

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
ERV - Rotary Wheel UPSTR	25.30%	29.30%	24.30%	21.00%

Measure Life Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
ERV - Rotary Wheel UPSTR	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
ERV - Rotary Wheel UPSTR	0.33	0.12	0.01	0.80

NTG Source: MA 2022 TRM

TRC: $9.65 / Gross therm

Incentive: $1.61 / Gross therm

Faucet Aerator

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: Water Heating **Measure Type:** Flow Control **Measure Sub Type:** Faucet Aerator

Program: Large C&I Retrofit

Measure Description

Installation of a faucet aerator with a flow rate of 1.5 GPM or less on an existing faucet with high flow in a commercial setting with service water heated by natural gas.

Baseline Description

The baseline efficiency case is a 2.2 GPM faucet.

Savings Principle

The high efficiency case is a faucet with 1.5 GPM or less aerator installed.

Savings Method

Deemed

Unit

Installed faucet aerator.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: 130.0.

Hours Source: Federal Energy Management Program (2010). Energy Cost Calculator for Faucets and Showerheads. Accessed on 10/12/2011.

Hours Note: The calculator used to determine the deemed savings uses a default operation of 30 minuts/day, 260 days/year. Not applicable for Multifamily applications.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Faucet Aerator	0	0.0000	0.00	1.70	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Faucet Aerator	5	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Faucet Aerator	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Federal Energy Management Program (2010). Energy Cost Calculator for Faucets and Showerheads. Accessed on 10/12/2011.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Faucet Aerator	5460.00	5460.00	0.08	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Faucet Aerator	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Food Service

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Food Service | **Measure Sub Type:** Year-round

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Food Service	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Food Service	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Food Service	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Food Service	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Food Service	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Furnace, Blend

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Furnace | **Measure Sub Type:** Blend

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Furnace, Blend	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Furnace, Blend	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Furnace, Blend	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Furnace, Blend	Calc	Calc	-0.05	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Furnace, Blend	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Furnace, Heating

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Furnace | **Measure Sub Type:** Heating

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Furnace, Heating	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Furnace, Heating	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Furnace, Heating	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Furnace, Heating	Calc	Calc	-0.07	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Furnace, Heating	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Furnace, Year-Round

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Furnace | **Measure Sub Type:** Year-round

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Furnace, Year-Round	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Furnace, Year-Round	multi	1.00	1.00	0.87					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Furnace, Year-Round	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-CG-CustGasPY19 - Impact Evaluation of PY2019 Custom Gas Installations

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Furnace, Year-Round	Calc	Calc	0.35	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Furnace, Year-Round	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Heat Pump

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Heat pump | **Measure Sub Type:** Blend

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heat Pump	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heat Pump	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heat Pump	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heat Pump	Calc	Calc	-0.07	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heat Pump	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Heat Recovery, Blend

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Heat Recovery | **Measure Sub Type:** Blend

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heat Recovery, Blend	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heat Recovery, Blend	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heat Recovery, Blend	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heat Recovery, Blend	Calc	Calc	-0.05	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heat Recovery, Blend	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $6.00 / Gross therm

Incentive: $3.00 / Gross therm

Heat Recovery, Heating

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Heat Recovery | **Measure Sub Type:** Heating

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heat Recovery, Heating	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heat Recovery, Heating	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heat Recovery, Heating	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heat Recovery, Heating	Calc	Calc	-0.07	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heat Recovery, Heating	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $6.00 / Gross therm

Incentive: $3.00 / Gross therm

Heat Recovery, Year-Round

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Heat Recovery | **Measure Sub Type:** Year-round

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heat Recovery, Year-Round	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heat Recovery, Year-Round	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heat Recovery, Year-Round	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heat Recovery, Year-Round	Calc	Calc	0.35	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heat Recovery, Year-Round	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $6.00 / Gross therm

Incentive: $3.00 / Gross therm

High-Pressure Steam Trap HVAC

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: HVAC **Measure Type:** Steam Traps **Measure Sub Type:** Steam Trap

Program: Large C&I Retrofit

Measure Description

The repair or replacement of malfunctioning steam traps in systems with an operating pressure greater than 15 psig.

Baseline Description

The baseline efficiency case is a failed steam trap.

Savings Principle

The high efficiency case is a repaired or replaced steam trap.

Savings Method

Deemed

Unit

Repaired or replaced steam trap.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
High-Pressure Steam Trap HVAC	0	0.0000	35.60	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: ERS Two-Tier Steam Trap Savings Study; April 26, 2018

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
High-Pressure Steam Trap HVAC	6	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
High-Pressure Steam Trap HVAC	0.00%	0.00%	0.00%	0.00%

Measure Life Source: DNV GL MA 2013,2017 Prescriptive Gas Impact Evaluation: Steam Trap Evaulation Phase 1 & 2

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
High-Pressure Steam Trap HVAC	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
High-Pressure Steam Trap HVAC	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.40 / Gross therm

Incentive: $2.20 / Gross therm

HVAC

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** HVAC | **Measure Sub Type:** Heating

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
HVAC	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
HVAC	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
HVAC	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
HVAC	Calc	Calc	-0.07	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
HVAC	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $6.00 / Gross therm

Incentive: $3.00 / Gross therm

HVAC insulation

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** HVAC | **Measure Sub Type:** Heating

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
HVAC insulation	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
HVAC insulation	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
HVAC insulation	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
HVAC insulation	Calc	Calc	-0.07	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
HVAC insulation	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $6.00 / Gross therm

Incentive: $3.00 / Gross therm

Low-Flow Showerhead

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Showerhead

Program: Large C&I Retrofit

Measure Description

Installation of a low flow showerhead with a flow rate of 1.5 GPM or less in a commercial setting with service water heated by natural gas.

Baseline Description

The baseline efficiency case is a 2.5 GPM showerhead.

Savings Principle

The high efficiency case is a 1.5 GPM showerhead.

Savings Method

Deemed

Unit

Installed low-flow showerhead

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low-Flow Showerhead	0	0.0000	0.00	5.20	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low-Flow Showerhead	10	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low-Flow Showerhead	0.00%	0.00%	0.00%	0.00%

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low-Flow Showerhead	7300.00	7300.00	0.08	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low-Flow Showerhead	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Low-Pressure Steam Trap HVAC

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: HVAC **Measure Type:** Steam Traps **Measure Sub Type:** Steam Trap

Program: Large C&I Retrofit

Measure Description

The repair or replacement of malfunctioning steam traps in systems with an operating pressure less than or equal to 15 psig.

Baseline Description

The baseline efficiency case is a failed steam trap.

Savings Principle

The high efficiency case is a repaired or replaced steam trap.

Savings Method

Deemed

Unit

Repaired or replaced steam trap.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Low-Pressure Steam Trap HVAC	0	0.0000	8.40	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: ERS Two-Tier Steam Trap Savings Study; April 26, 2018

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Low-Pressure Steam Trap HVAC	6	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Low-Pressure Steam Trap HVAC	0.00%	0.00%	0.00%	0.00%

Measure Life Source: DNV GL MA 2013,2017 Prescriptive Gas Impact Evaluation: Steam Trap Evaulation Phase 1 & 2

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Low-Pressure Steam Trap HVAC	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Low-Pressure Steam Trap HVAC	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.40 / Gross therm

Incentive: $2.20 / Gross therm

Operation & Maintenance

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** O&M | **Measure Sub Type:** Heating

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Operation & Maintenance	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Operation & Maintenance	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Operation & Maintenance	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Operation & Maintenance	Calc	Calc	-0.07	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Operation & Maintenance	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $2.50 / Gross therm

Incentive: $1.25 / Gross therm

Other, Blend

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Custom | **Measure Sub Type:** Blend

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Other, Blend	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Other, Blend	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Other, Blend	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Other, Blend	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Other, Blend	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $6.80 / Gross therm

Incentive: $3.40 / Gross therm

Other, Heating

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Other | **Measure Sub Type:** Heating

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Other, Heating	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Other, Heating	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Other, Heating	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Other, Heating	Calc	Calc	-0.07	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Other, Heating	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $6.00 / Gross therm

Incentive: $3.00 / Gross therm

Other, Year-Round

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Other | **Measure Sub Type:** Year-round

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Other, Year-Round	Calc	Calc	Calc	Calc	Calc	Calc	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Other, Year-Round	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Other, Year-Round	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Other, Year-Round	Calc	Calc	0.35	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Other, Year-Round	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $6.00 / Gross therm

Incentive: $3.00 / Gross therm

Pre-Rinse Spray Valve

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Flow Control | **Measure Sub Type:** Low Flow Spray Valve

Program: Large C&I Retrofit

Measure Description

Retrofitting existing standard spray nozzles in locations where service water is supplied by natural gas fired hot water heater with new low flow pre-rinse spray nozzles with an average flow rate of 1.6 GPM.

Baseline Description

The baseline efficiency case is a standard efficiency spray valve.

Savings Principle

The high efficiency case is a low flow pre-rinse spray valve with an average flow rate of 1.6 GPM.

Savings Method

Deemed

Unit

Installed pre-rinse spray valve.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Pre-Rinse Spray Valve	0	0.0000	0.00	11.40	0.00	0.00	0.00

Gas DHW MMBtu Source: DNV GL (2014)Impact Evaluation of Massachusetts Prescriptive Gas Pre-Rinse Spray Valve Measure

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Pre-Rinse Spray Valve	8	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Pre-Rinse Spray Valve	0.00%	0.00%	0.00%	0.00%

Measure Life Source: DNV GL (2014)Impact Evaluation of Massachusetts Prescriptive Gas Pre-Rinse Spray Valve Measure

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Pre-Rinse Spray Valve	6410.00	6410.00	0.08	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Pre-Rinse Spray Valve	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Process

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Process | **Measure Sub Type:** Year-round

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Process	Calc	Calc	Calc	Calc	Calc	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Process	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Process	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Process	Calc	Calc	-0.05	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Process	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Programmable Thermostat

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Thermostat

Program: Large C&I Retrofit

Measure Description

Installation of programmable thermostats with the ability to adjust heating or air-conditioning operating times according to a pre-set schedule to meet occupancy needs and minimize redundant HVAC operation.

Baseline Description

The baseline efficiency case is an HVAC system using natural gas to provide space heating without a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system using natural gas to provide space heating with a programmable thermostat installed.

Savings Method

Deemed

Unit

Installed programmable thermostat

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Programmable Thermostat	0	0.0000	3.20	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: DNV-GL, MA45 Prescriptive Programmable Thermostats, March 2017

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Programmable Thermostat	15	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Programmable Thermostat	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Environmental Protection Agency (2010). Life Cycle Cost Estimate for Programmable Thermostats. Accessed on 10/12/2011.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Programmable Thermostat	0.00	0.00	0.59	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Programmable Thermostat	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.40 / Gross therm

Incentive: $2.20 / Gross therm

ROOF INSULATION

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: Whole Building **Measure Type:** Insulation **Measure Sub Type:** Roof

Program: Large C&I Retrofit

Measure Description

Installation of roof insulation in existing facilities.

Baseline Description

The base case is the existing roof insulation level.

Savings Principle

The high efficiency case is the installed insulation level.

Savings Method

Calculated using site-specific inputs

Unit

Completed insulation project.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
ROOF INSULATION	Calc	Calc	0.25	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
ROOF INSULATION	25	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
ROOF INSULATION	0.00%	0.00%	0.00%	0.00%

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
ROOF INSULATION	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
ROOF INSULATION	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Solar Heat Blend

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Solar heat | **Measure Sub Type:** Blend

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Solar Heat Blend	Calc	Calc	Calc	Calc	Calc	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Solar Heat Blend	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Solar Heat Blend	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Solar Heat Blend	Calc	Calc	-0.05	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Solar Heat Blend	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Solar Heat Year-Round (DHW)

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Solar heat | **Measure Sub Type:** Year-round

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Solar Heat Year-Round (DHW)	Calc	Calc	Calc	Calc	Calc	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Solar Heat Year-Round (DHW)	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Solar Heat Year-Round (DHW)	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Solar Heat Year-Round (DHW)	Calc	Calc	0.35	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Solar Heat Year-Round (DHW)	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Solar Heating

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Solar heat | **Measure Sub Type:** Heating

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Solar Heating	Calc	Calc	Calc	Calc	Calc	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Solar Heating	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Solar Heating	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Solar Heating	Calc	Calc	-0.07	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Solar Heating	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

Steam Trap

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Steam Traps | **Measure Sub Type:** Heating

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Steam Trap	Calc	Calc	Calc	Calc	Calc	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Steam Trap	6	1.00	1.00	0.87					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Steam Trap	0.00%	0.00%	0.00%	0.00%

Measure Life Source: DNV GL MA 2013,2017 Prescriptive Gas Impact Evaluation: Steam Trap Evaulation Phase 1 & 2

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-CG-CustGasPY19 - Impact Evaluation of PY2019 Custom Gas Installations

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Steam Trap	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Steam Trap	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $2.50 / Gross therm

Incentive: $1.25 / Gross therm

Ventilation Reduction

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Ventilation | **Measure Sub Type:** Heating

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Ventilation Reduction	Calc	Calc	Calc	Calc	Calc	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Ventilation Reduction	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Ventilation Reduction	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Ventilation Reduction	Calc	Calc	-0.07	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Ventilation Reduction	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.40 / Gross therm

Incentive: $2.20 / Gross therm

Verified Savings

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Verified savings | **Measure Sub Type:** Heating

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Verified Savings	Calc	Calc	Calc	Calc	Calc	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Verified Savings	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Verified Savings	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Verified Savings	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Verified Savings	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.40 / Gross therm

Incentive: $2.20 / Gross therm

VSDs on HVAC

Sector: C&I **Fuel:** Gas **Program Type:** Custom

Measure Category: Custom **Measure Type:** VSD **Measure Sub Type:** Heating

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
VSDs on HVAC	Calc	Calc	Calc	Calc	Calc	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
VSDs on HVAC	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
VSDs on HVAC	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
VSDs on HVAC	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
VSDs on HVAC	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

VSDs on Non-HVAC

Sector: C&I **Fuel:** Gas **Program Type:** Custom

Measure Category: Custom **Measure Type:** VSD **Measure Sub Type:** Blend

Program: Large C&I Retrofit

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
VSDs on Non-HVAC	Calc	Calc	Calc	Calc	Calc	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
VSDs on Non-HVAC	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
VSDs on Non-HVAC	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
VSDs on Non-HVAC	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
VSDs on Non-HVAC	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

WiFi Tstat - Cooling and Heating

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** WiFi T-stat

Program: Large C&I Retrofit

Measure Description

A communicating thermostat which allows remote set point adjustment and control via remote application. System requires an outdoor air temperature algorithm in the control logic to operate heating and cooling systems.

Baseline Description

The baseline efficiency case is an HVAC system with either a manual or a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system that has a Wi-Fi thermostat installed.

Savings Method

Deemed

Unit

Installation of WiFi programmable thermostat

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
WiFi Tstat - Cooling and Heating	0	0	6.60	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
WiFi Tstat - Cooling and Heating	15	1.00	1.00	1.00	1.00	1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
WiFi Tstat - Cooling and Heating	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Environmental Protection Agency (2010). Life Cycle Cost Estimate for Programmable Thermostats. Accessed on 10/12/2011.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
WiFi Tstat - Cooling and Heating	0.00	0.00	0.59	0.00

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-ClOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
WiFi Tstat - Cooling and Heating	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.40 / Gross therm

Incentive: $2.20 / Gross therm

WiFi Tstat - Heating Only

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** WiFi T-stat

Program: Large C&I Retrofit

Measure Description

A communicating thermostat which allows remote set point adjustment and control via remote application. System requires an outdoor air temperature algorithm in the control logic to operate heating and cooling systems Primary Energy Impact: Natural Gas.

Baseline Description

The baseline efficiency case is an HVAC system with either a manual or a programmable thermostat.

Savings Principle

The high efficiency case is an HVAC system that has a Wi-Fi thermostat installed.

Savings Method

Deemed

Unit

Installation of WiFi programmable thermostat

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
WiFi Tstat - Heating Only	0	0	6.60	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
WiFi Tstat - Heating Only	15	1.00	1.00	1.00		1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
WiFi Tstat - Heating Only	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Environmental Protection Agency (2010). Life Cycle Cost Estimate for Programmable Thermostats. Accessed on 10/12/2011.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
WiFi Tstat - Heating Only	0.00	0.00	0.59	0.00

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
WiFi Tstat - Heating Only	0.07	0.00	0.16	1.09

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.40 / Gross therm

Incentive: $2.20 / Gross therm

Advanced Building

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Whole Building | **Measure Sub Type:** Heating

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Advanced Building	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Advanced Building	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Advanced Building	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Advanced Building	Calc	Calc	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Advanced Building	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

BOILER RESET 1 STAGE

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Controls | **Measure Sub Type:** Boiler Control

Program: Large Commercial New Construction

Measure Description

Boiler reset controls are devices that improve the efficiency of an existing boiler system by modulating the hot water temperature set point. Reset controls automatically control boiler water temperature based on outdoor temperature using a software program; load controls sense the thermal demand of the heating system and resets the water temperature based on the demand.

Baseline Description

The baseline efficiency case is a boiler without reset or load controls.

Savings Principle

The efficient case is a boiler with reset or load controls, which reset the supply water temperature based on outdoor temperatures and/or building load.

Savings Method

Deemed

Unit

Installation of boiler reset control on existing boiler

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
BOILER RESET 1 STAGE	0	0.0000	35.50	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
BOILER RESET 1 STAGE	15	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
BOILER RESET 1 STAGE	0.00%	0.00%	0.00%	0.00%

Measure Life Source: ACEEE (2006). Emerging Technologies Report: Advanced Boiler Controls. Prepared for ACEEE.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
BOILER RESET 1 STAGE	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
BOILER RESET 1 STAGE	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.80 / Gross therm

Incentive: $3.00 / Gross Therm

Boiler, Condensing Blend

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Boiler | **Measure Sub Type:** Blend

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Boiler, Condensing Blend	Calc	Calc	0.00	0.00	Calc	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Boiler, Condensing Blend	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Boiler, Condensing Blend	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Boiler, Condensing Blend	Calc	Calc	-0.01	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Boiler, Condensing Blend	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Boiler, Condensing Heating

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Boiler | **Measure Sub Type:** Heating

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Boiler, Condensing Heating	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Boiler, Condensing Heating	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Boiler, Condensing Heating	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Boiler, Condensing Heating	Calc	Calc	-0.01	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Boiler, Condensing Heating	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Boiler, Condensing Year-Round

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Boiler | **Measure Sub Type:** Year-round

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Boiler, Condensing Year-Round	Calc	Calc	0.00	Calc	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Boiler, Condensing Year-Round	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Boiler, Condensing Year-Round	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Boiler, Condensing Year-Round	Calc	Calc	-0.01	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Boiler, Condensing Year-Round	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Boiler, Non-Condensing Blend

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Boiler | **Measure Sub Type:** Blend

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Boiler, Non-Condensing Blend	Calc	Calc	0.00	0.00	Calc	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Boiler, Non-Condensing Blend	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Boiler, Non-Condensing Blend	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Boiler, Non-Condensing Blend	Calc	Calc	-0.01	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Boiler, Non-Condensing Blend	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Boiler, Non-Condensing Heating

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Boiler | **Measure Sub Type:** Heating

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Boiler, Non-Condensing Heating	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Boiler, Non-Condensing Heating	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Boiler, Non-Condensing Heating	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Boiler, Non-Condensing Heating	Calc	Calc	-0.01	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Boiler, Non-Condensing Heating	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Boiler, Non-Condensing Year-Round

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Boiler | **Measure Sub Type:** Year-round

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Boiler, Non-Condensing Year-Round	Calc	Calc	0.00	Calc	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Boiler, Non-Condensing Year-Round	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Boiler, Non-Condensing Year-Round	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Boiler, Non-Condensing Year-Round	Calc	Calc	-0.01	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Boiler, Non-Condensing Year-Round	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Boiler95

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Heating | **Measure Sub Type:** Boiler

Program: Large Commercial New Construction

Measure Description

The installation of a high efficiency natural gas fired condensing boilers. High efficiency boilers take advantage of improved design, sealed combustion and condensing flue gases in a second heat exchanger to achieve improved efficiency. (Only condensingboilers are offered as prescriptive measures. Program incentives for other boiler types are offered through the custom program.)

Baseline Description

The baseline efficiency assumes compliance with the International Energy Conservation Code (IECC) 2012. Table 19 in Appendix A details the specific efficiency requirements by equipment type and capacity.

Savings Principle

The high efficiency case assumes a gas-fired boiler that exceeds the efficiency levels required by Rhode Island State Building Code. Actual site efficiencies should be determined on a case-by-case basis.

Savings Method

Deemed

Unit

Installed high-efficiency condensing boiler

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Boiler95	0	0.0000	27.80	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Boiler95	25	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Boiler95	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Energy realization rate is 100% because deemed savings are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Boiler95	0.00	0.00	-0.09	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Boiler95	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.80 / Gross therm

Incentive: $3.00 / Gross Therm

Building Shell

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Whole Building | **Measure Sub Type:** Heating

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Building Shell	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Building Shell	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Building Shell	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Building Shell	Calc	Calc	0.32	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Building Shell	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

CODES AND STANDARDS

Sector: C&I

Fuel: Gas

Program Type: Custom

Measure Category: Codes and Standards

Measure Type: Codes and Standards

Measure Sub Type: Codes and Standards

Program: Large Commercial New Construction

Measure Description

Energy efficiency code trainings and advocacy work to improve energy efficiency of buildings and equipment within Rhode Island.

Baseline Description

Un-influenced adoption curve of federal minimum codes and standards.

Savings Principle

Accelerated adoption of advancing energy codes and equipment standards.

Savings Method

Calculated based on attribution study

Unit

Adoption of advancing energy codes and equipment standards.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
CODES AND STANDARDS	Calc	0.0000	Calc	0.00	0.00	0.00	0.00

Electric kWh Source: NMR - Rhode Island Code Compliance Enhancement Initiative Attribution and Savings Study

Gas Heat MMBtu Source: NMR - Rhode Island Code Compliance Enhancement Initiative Attribution and Savings Study

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
CODES AND STANDARDS	20	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
CODES AND STANDARDS	0.00%	0.00%	0.00%	0.00%

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
CODES AND STANDARDS	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
CODES AND STANDARDS	0.00	0.00	0.00	1.00

NTG Note: The Net-to-Gross ratio is assumed to be 100%.

Combined Heat and Power (Gas)

Sector: C&I **Fuel:** Gas **Program Type:** Custom

Measure Category: Custom **Measure Type:** CHP **Measure Sub Type:** Blend

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Combined Heat and Power (Gas)	Calc	Calc	0.00	0.00	Calc	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Combined Heat and Power (Gas)	multi	1.00	1.00	0.87					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Combined Heat and Power (Gas)	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: RI-20-CG-CustGasPY19 - Impact Evaluation of PY2019 Custom Gas Installations

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Combined Heat and Power (Gas)	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Combined Heat and Power (Gas)	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

COMBO COND BOIL/WTR HTR 90+

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Boiler | **Measure Sub Type:** Combo Condensing

Program: Large Commercial New Construction

Measure Description

This measure promotes the installation of a combined high-efficiency boiler and water heating unit. Combined boiler and water heating systems are more efficient than separate systems because they eliminate the standby heat losses of an additional tank.

Baseline Description

The baseline efficiency case is an 80% AFUE boiler with a 0.594 EF water heater.

Savings Principle

The high efficiency case is a condensing, integrated water heater/boiler with an AFUE >= 90%.

Savings Method

Deemed

Unit

Installed high-efficiency condensing combination DHW heater / boiler

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
COMBO COND BOIL/WTR HTR 90+	0	0	24.60	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
COMBO COND BOIL/WTR HTR 90+	20	1.00	1.00	1.00		1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
COMBO COND BOIL/WTR HTR 90+	0.00%	0.00%	0.00%	0.00%

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
COMBO COND BOIL/WTR HTR 90+	0.00	0.00	-0.08	0.00

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
COMBO COND BOIL/WTR HTR 90+	0.71	0.00	0.00	0.29

NTG Source: TXC 35 MA C&I Upstream HVAC NTG & Market Effects Study

COMBO COND BOIL/WTR HTR 95+

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Boiler | **Measure Sub Type:** Combo Condensing

Program: Large Commercial New Construction

Measure Description

This measure promotes the installation of a combined high-efficiency boiler and water heating unit. Combined boiler and water heating systems are more efficient than separate systems because they eliminate the standby heat losses of an additional tank.

Baseline Description

The baseline efficiency case is an 80% AFUE boiler with a 0.594 EF water heater.

Savings Principle

The high efficiency case is a condensing, integrated water heater/boiler with an AFUE >= 95%.

Savings Method

Deemed

Unit

Installed high-efficiency condensing combination DHW heater / boiler

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
COMBO COND BOIL/WTR HTR 95+	0	0	31.80	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
COMBO COND BOIL/WTR HTR 95+	20	1.00	1.00	1.00		1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
COMBO COND BOIL/WTR HTR 95+	0.00%	0.00%	0.00%	0.00%

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
COMBO COND BOIL/WTR HTR 95+	0.00	0.00	-0.08	0.00

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
COMBO COND BOIL/WTR HTR 95+	0.71	0.00	0.00	0.29

NTG Source: TXC 35 MA C&I Upstream HVAC NTG & Market Effects Study

TRC: $3.20 / Gross therm

Incentive: $2.00 / Gross Therm

COMBO COND FURN/WTR HTR

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: HVAC **Measure Type:** Heating **Measure Sub Type:** Furnace

Program: Large Commercial New Construction

Measure Description

Installation of a combination furnace/water heater.

Baseline Description

It is assumed that the baseline is an 85% AFUE furnace and a separate high draw gas fired storage water heater with an efficiency rating of 0.63 UEF.

Savings Principle

A new combination 97% AFUE furnace and 0.90 tankless water heater.

Savings Method

Deemed

Unit

Installed high-efficiency combination condensing furnace/DHW heater

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
COMBO COND FURN/WTR HTR	0	0	0.00	0.00	14.30	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
COMBO COND FURN/WTR HTR	18	1.00	1.00	1.00		1.00	1.00	0.00	0.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
COMBO COND FURN/WTR HTR	0.00%	0.00%	0.00%	0.00%

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
COMBO COND FURN/WTR HTR	0.00	0.00	-0.08	0.00

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
COMBO COND FURN/WTR HTR	0.71	0.00	0.00	0.29

NTG Source: TXC 35 MA C&I Upstream HVAC NTG & Market Effects Study

Comprehensive Design

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Whole Building | **Measure Sub Type:** Heating

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Comprehensive Design	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Comprehensive Design	multi	1.00	1.00	0.97					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Comprehensive Design	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Comprehensive Design	Calc	Calc	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Comprehensive Design	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $6.40 / Gross therm

Incentive: $4.00 / Gross Therm

Comprehensive Design Assistance

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Whole Building | **Measure Sub Type:** Heating

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Comprehensive Design Assistance	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Comprehensive Design Assistance	multi	1.00	1.00	0.97					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Comprehensive Design Assistance	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Comprehensive Design Assistance	Calc	Calc	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Comprehensive Design Assistance	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

COND UNIT HEATER 151-300 MBH

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: HVAC **Measure Type:** Heating **Measure Sub Type:** Unit Heater

Program: Large Commercial New Construction

Measure Description

The baseline efficiency case is a standard efficiency gas fired unit heater with minimum combustion efficiency of 80%, interrupted or intermittent ignition device (IID), and either power venting or an automatic flue damper.

Baseline Description

The baseline efficiency case is a standard efficiency unit heater.

Savings Principle

The high efficiency case is a condensing gas unit heater with 90% AFUE or greater.

Savings Method

Deemed

Unit

Installed condensing unit heater.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
COND UNIT HEATER 151-300 MBH	0	0.0000	40.90	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
COND UNIT HEATER 151-300 MBH	18	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
COND UNIT HEATER 151-300 MBH	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Ecotrope, Inc. (2003). Natural Gas Efficiency and Conservation Measure Resource Assessment for the Residential and Commercial Sectors. Prepared for the Energy Trust of Oregon.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
COND UNIT HEATER 151-300 MBH	0.00	0.00	-0.08	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
COND UNIT HEATER 151-300 MBH	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

COND WATER HEATER 94%MIN 75-300 MBH

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Water Heater | **Measure Sub Type:** Condensing Water Heater

Program: Large Commercial New Construction

Measure Description

The installation of a high-efficiency condensing water heater over 94% and between 75-300 kBtuh.

Baseline Description

The baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code. For condensing stand-alone water heaters, the baseline is a stand-alone tank water heater with a thermal efficiency of 80%.

Savings Principle

The high efficiency case is a condensing stand-alone commercial water heater with a thermal efficiency of 95% or greater and a capacity between 75,000 Btu and 300,000 Btu.

Savings Method

Deemed

Unit

Installed high-efficiency water heater.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
COND WATER HEATER 94%MIN 75-300 MBH	0	0.0000	0.00	31.80	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
COND WATER HEATER 94%MIN 75-300 MBH	15	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
COND WATER HEATER 94%MIN 75-300 MBH	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
COND WATER HEATER 94%MIN 75-300 MBH	0.00	0.00	-0.08	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
COND WATER HEATER 94%MIN 75-300 MBH	0.71	0.00	0.00	0.29

NTG Source: TXC 35 MA C&I Upstream HVAC NTG & Market Effects Study

TRC: $6.40 / Gross therm

Incentive: $4.16 / Gross Therm

Condensing Boiler <= 300 MBH, 95% AFUE

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: HVAC **Measure Type:** Heating **Measure Sub Type:** Boiler

Program: Large Commercial New Construction

Measure Description

The installation of a high efficiency natural gas fired condensing boilers. High efficiency boilers take advantage of improved design, sealed combustion and condensing flue gases in a second heat exchanger to achieve improved efficiency. (Only condensingboilers are offered as prescriptive measures. Program incentives for other boiler types are offered through the custom program.)

Baseline Description

The baseline efficiency assumes compliance with the International Energy Conservation Code (IECC) 2012. Table 19 in Appendix A details the specific efficiency requirements by equipment type and capacity.

Savings Principle

The high efficiency case assumes a gas-fired boiler up to 300 MBH that is >= 95% AFUE.

Savings Method

Deemed

Unit

Installed high-efficiency condensing boiler with 95%+ AFUE

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Condensing Boiler <= 300 MBH, 95% AFUE	0	0.0000	17.70	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: C&I Prescriptive and Custom NTG Omnibus Study (MA20X07-B-CIOMNINTG)

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Condensing Boiler <= 300 MBH, 95% AFUE	25	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Condensing Boiler <= 300 MBH, 95% AFUE	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Energy realization rate is 100% because deemed savings are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Condensing Boiler <= 300 MBH, 95% AFUE	0.00	0.00	-0.08	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Condensing Boiler <= 300 MBH, 95% AFUE	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.64 / Gross therm

Incentive: $2.91 / Gross Therm

Condensing Boiler <=300 MBH

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: HVAC **Measure Type:** Heating **Measure Sub Type:** Boiler

Program: Large Commercial New Construction

Measure Description

The installation of a high efficiency natural gas fired condensing boilers. High efficiency boilers take advantage of improved design, sealed combustion and condensing flue gases in a second heat exchanger to achieve improved efficiency. (Only condensingboilers are offered as prescriptive measures. Program incentives for other boiler types are offered through the custom program.)

Baseline Description

The baseline efficiency assumes compliance with the International Energy Conservation Code (IECC) 2012. Table 19 in Appendix A details the specific efficiency requirements by equipment type and capacity.

Savings Principle

The high efficiency case assumes a gas-fired boiler up to 300 MBH that is >= 90% AFUE.

Savings Method

Deemed

Unit

Installed high-efficiency condensing boiler with 90%+ AFUE

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Condensing Boiler <=300 MBH	0	0.0000	14.70	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: C&I Prescriptive and Custom NTG Omnibus Study (MA20X07-B-CIOMNINTG)

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Condensing Boiler <=300 MBH	25	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Condensing Boiler <=300 MBH	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Energy realization rate is 100% because deemed savings are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Condensing Boiler <=300 MBH	0.00	0.00	-0.08	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Condensing Boiler <=300 MBH	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.80 / Gross therm

Incentive: $3.00 / Gross Therm

Condensing Boiler >1,700 MBH

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: HVAC **Measure Type:** Heating **Measure Sub Type:** Boiler

Program: Large Commercial New Construction

Measure Description

The installation of a high efficiency natural gas fired condensing boilers. High efficiency boilers take advantage of improved design, sealed combustion and condensing flue gases in a second heat exchanger to achieve improved efficiency. (Only condensingboilers are offered as prescriptive measures. Program incentives for other boiler types are offered through the custom program.)

Baseline Description

The baseline efficiency assumes compliance with the International Energy Conservation Code (IECC) 2012. Table 19 in Appendix A details the specific efficiency requirements by equipment type and capacity.

Savings Principle

The high efficiency case assumes a gas-fired boiler 1701+ MBH that is >= 90% AFUE.

Savings Method

Deemed

Unit

Installed high-efficiency condensing boiler with 90%+ AFUE

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Condensing Boiler >1,700 MBH	0	0.0000	165.30	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: C&I Prescriptive and Custom NTG Omnibus Study (MA20X07-B-CIOMNINTG)

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Condensing Boiler >1,700 MBH	25	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Condensing Boiler >1,700 MBH	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Energy realization rate is 100% because deemed savings are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Condensing Boiler >1,700 MBH	0.00	0.00	-0.08	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Condensing Boiler >1,700 MBH	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.80 / Gross therm

Incentive: $3.00 / Gross Therm

Condensing Boiler 1,000-1,700 MBH

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: HVAC **Measure Type:** Heating **Measure Sub Type:** Boiler

Program: Large Commercial New Construction

Measure Description

The installation of a high efficiency natural gas fired condensing boilers. High efficiency boilers take advantage of improved design, sealed combustion and condensing flue gases in a second heat exchanger to achieve improved efficiency. (Only condensingboilers are offered as prescriptive measures. Program incentives for other boiler types are offered through the custom program.)

Baseline Description

The baseline efficiency assumes compliance with the International Energy Conservation Code (IECC) 2012. Table 19 in Appendix A details the specific efficiency requirements by equipment type and capacity.

Savings Principle

The high efficiency case assumes a gas-fired boiler 1000 to 1700 MBH that is >= 90% AFUE.

Savings Method

Deemed

Unit

Installed high-efficiency condensing boiler with 90%+ AFUE

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Condensing Boiler 1,000-1,700 MBH	0	0.0000	94.50	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: C&I Prescriptive and Custom NTG Omnibus Study (MA20X07-B-CIOMNINTG)

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Condensing Boiler 1,000-1,700 MBH	25	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Condensing Boiler 1,000-1,700 MBH	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Energy realization rate is 100% because deemed savings are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Condensing Boiler 1,000-1,700 MBH	0.00	0.00	-0.08	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Condensing Boiler 1,000-1,700 MBH	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.80 / Gross therm

Incentive: $3.00 / Gross Therm

Condensing Boiler 300-499 MBH

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: HVAC **Measure Type:** Heating **Measure Sub Type:** Boiler

Program: Large Commercial New Construction

Measure Description

The installation of a high efficiency natural gas fired condensing boilers. High efficiency boilers take advantage of improved design, sealed combustion and condensing flue gases in a second heat exchanger to achieve improved efficiency. (Only condensingboilers are offered as prescriptive measures. Program incentives for other boiler types are offered through the custom program.)

Baseline Description

The baseline efficiency assumes compliance with the International Energy Conservation Code (IECC) 2012. Table 19 in Appendix A details the specific efficiency requirements by equipment type and capacity.

Savings Principle

The high efficiency case assumes a gas-fired boiler 300 to 499 MBH that is >= 90% AFUE.

Savings Method

Deemed

Unit

Installed high-efficiency condensing boiler with 90%+ AFUE

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Condensing Boiler 300-499 MBH	0	0.0000	28.00	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: C&I Prescriptive and Custom NTG Omnibus Study (MA20X07-B-CIOMNINTG)

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Condensing Boiler 300-499 MBH	25	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Condensing Boiler 300-499 MBH	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Energy realization rate is 100% because deemed savings are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Condensing Boiler 300-499 MBH	0.00	0.00	-0.08	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Condensing Boiler 300-499 MBH	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.80 / Gross therm

Incentive: $3.00 / Gross Therm

Condensing Boiler 500-999 MBH

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: HVAC **Measure Type:** Heating **Measure Sub Type:** Boiler

Program: Large Commercial New Construction

Measure Description

The installation of a high efficiency natural gas fired condensing boilers. High efficiency boilers take advantage of improved design, sealed combustion and condensing flue gases in a second heat exchanger to achieve improved efficiency. (Only condensingboilers are offered as prescriptive measures. Program incentives for other boiler types are offered through the custom program.)

Baseline Description

The baseline efficiency assumes compliance with the International Energy Conservation Code (IECC) 2012. Table 19 in Appendix A details the specific efficiency requirements by equipment type and capacity.

Savings Principle

The high efficiency case assumes a gas-fired boiler 500 to 999 MBH that is >= 90% AFUE.

Savings Method

Deemed

Unit

Installed high-efficiency condensing boiler with 90%+ AFUE

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Condensing Boiler 500-999 MBH	0	0.0000	51.40	0.00	0.00	0.00	0.00

Gas Heat MMBtu Source: C&I Prescriptive and Custom NTG Omnibus Study (MA20X07-B-CIOMNINTG)

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Condensing Boiler 500-999 MBH	25	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Condensing Boiler 500-999 MBH	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Energy realization rate is 100% because deemed savings are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Condensing Boiler 500-999 MBH	0.00	0.00	-0.08	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Condensing Boiler 500-999 MBH	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.80 / Gross therm

Incentive: $3.00 / Gross Therm

COOKING-COMBO OVEN 1

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: Food Service **Measure Type:** Cooking Equipment **Measure Sub Type:** Oven

Program: Large Commercial New Construction

Measure Description

Installation of high efficiency gas-fired ovens.

Baseline Description

The baseline efficiency case is a standard efficiency oven (35% convection mode; 20% steam mode).

Savings Principle

The high efficiency case is an oven that meets or exceeds 44% efficiency convection mode, 38% steam mode.

Savings Method

Deemed

Unit

Installed high-efficiency gas-fired oven.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
COOKING-COMBO OVEN 1	0	0	0.00	110.30	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
COOKING-COMBO OVEN 1	12	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
COOKING-COMBO OVEN 1	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Food Service Technology Center (2011). Gas Combination Oven Life-Cycle Cost Calculator.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: 100% realization rates are assumed because savings are based on researched assumptions by FSTC.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
COOKING-COMBO OVEN 1	0.00	0.00	0.26	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
COOKING-COMBO OVEN 1	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $1.89 / Gross therm

Incentive: $1.12 / Gross Therm

COOKING-CONVECTION OVEN 1

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: Food Service **Measure Type:** Cooking Equipment **Measure Sub Type:** Oven

Program: Large Commercial New Construction

Measure Description

Installation of high efficiency gas-fired ovens.

Baseline Description

The baseline efficiency case is a standard efficiency oven (30%).

Savings Principle

The high efficiency case is an oven that meets or exceeds 49% efficiency.

Savings Method

Deemed

Unit

Installed high-efficiency gas-fired oven.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
COOKING-CONVECTION OVEN 1	0	0	0.00	35.70	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
COOKING-CONVECTION OVEN 1	12	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
COOKING-CONVECTION OVEN 1	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Food Service Technology Center (2012). Gas Convection Oven Life-Cycle Cost Calculator. http://www.fishnick.com/saveenergy/tools/calculators/govencalc.php.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: 100% realization rates are assumed because savings are based on researched assumptions by FSTC.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
COOKING-CONVECTION OVEN 1	0.00	0.00	0.26	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
COOKING-CONVECTION OVEN 1	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $4.93 / Gross therm

Incentive: $3.08 / Gross Therm

COOKING-CONVEYOR OVEN 1

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: Food Service **Measure Type:** Cooking Equipment **Measure Sub Type:** Oven

Program: Large Commercial New Construction

Measure Description

Installation of high efficiency gas-fired ovens.

Baseline Description

The baseline efficiency case is a standard efficiency oven (20%).

Savings Principle

The high efficiency case is an oven that meets or exceeds 42% efficiency.

Savings Method

Deemed

Unit

Installed high-efficiency gas-fired oven.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
COOKING-CONVEYOR OVEN 1	0	0	0.00	88.40	0.00	0.00	0.00

Gas DHW MMBtu Source: Food Service Technology Center (2011). Gas Conveyor Oven Life-Cycle Cost Calculator.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
COOKING-CONVEYOR OVEN 1	12	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
COOKING-CONVEYOR OVEN 1	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Food Service Technology Center (2011). Gas Conveyor Oven Life-Cycle Cost Calculator.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: 100% realization rates are assumed because savings are based on researched assumptions by FSTC.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
COOKING-CONVEYOR OVEN 1	0.00	0.00	0.26	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
COOKING-CONVEYOR OVEN 1	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $1.99 / Gross therm

Incentive: $1.24 / Gross Therm

COOKING-FRYER-1000

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: Food Service **Measure Type:** Cooking Equipment **Measure Sub Type:** Fryer

Program: Large Commercial New Construction

Measure Description

The installation of a natural-gas fired fryer that is either ENERGY Star rated or has a heavy-load cooking efficiency of at least 50%. Qualified fryers use advanced burner and heat exchanger designs to use fuel more efficiently, as well as increased insulation to reduce standby heat loss.

Baseline Description

The baseline efficiency case is a non-Energy Star qualified fryer.

Savings Principle

The high efficiency case is an Energy Star qualified fryer.

Savings Method

Deemed

Unit

Installed high-efficiency gas-fired fryer.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
COOKING-FRYER-1000	0	0	0.00	78.30	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
COOKING-FRYER-1000	12	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
COOKING-FRYER-1000	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Environmental Protection Agency (2009). Life Cycle Cost Estimate for ENERGY STAR Qualified Gas Fryer.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: 100% realization rates are assumed because savings are based on researched assumptions by FSTC.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
COOKING-FRYER-1000	0.00	0.00	0.26	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
COOKING-FRYER-1000	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $2.66 / Gross therm

Incentive: $1.66 / Gross Therm

COOKING-GRIDDLE 1

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: Food Service **Measure Type:** Cooking Equipment **Measure Sub Type:** Griddle

Program: Large Commercial New Construction

Measure Description

Installation of a high efficiency gas griddle that meets ENERGY STAR® specifications or have a tested heavy load cooking efficiency of at least 38% and an idle energy rate <= 2,650 Btu/h per square foot of cooking surface utilizing ASTM Standard F1275.

Baseline Description

The baseline efficiency case is a non-ENERGY STAR® qualified gas griddle.

Savings Principle

The high efficiency case is an ENERGY STAR® qualified gas griddle.

Savings Method

Deemed

Unit

Installed high-efficiency gas-fired griddle

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
COOKING-GRIDDLE 1	0	0	0.00	37.90	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
COOKING-GRIDDLE 1	12	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
COOKING-GRIDDLE 1	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Food Service Technology Center (2011). Gas Griddle Life-Cycle Cost Calculation. Accessed on 10/12/2011.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: 100% realization rates are assumed because savings are based on researched assumptions by FSTC.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
COOKING-GRIDDLE 1	0.00	0.00	0.26	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
COOKING-GRIDDLE 1	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $2.32 / Gross therm

Incentive: $1.45 / Gross Therm

COOKING-RACK OVEN 1

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: Food Service **Measure Type:** Cooking Equipment **Measure Sub Type:** Oven

Program: Large Commercial New Construction

Measure Description

Installation of high efficiency gas-fired ovens.

Baseline Description

The baseline efficiency case is a standard efficiency oven (30%).

Savings Principle

The high efficiency case is an oven that meets or exceeds 50% efficiency.

Savings Method

Deemed

Unit

Installed high-efficiency gas-fired oven.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
COOKING-RACK OVEN 1	0	0	0.00	211.30	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
COOKING-RACK OVEN 1	12	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
COOKING-RACK OVEN 1	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Food Service Technology Center (2011). Gas Conveyor Oven Life-Cycle Cost Calculator.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: 100% realization rates are assumed because savings are based on researched assumptions by FSTC.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
COOKING-RACK OVEN 1	0.00	0.00	0.26	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
COOKING-RACK OVEN 1	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.80 / Gross therm

Incentive: $0.50 / Gross Therm

COOKING-STEAMER-1000

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: Food Service **Measure Type:** Cooking Equipment **Measure Sub Type:** Steamer

Program: Large Commercial New Construction

Measure Description

The installation of an ENERGY STAR® rated natural-gas fired steamer, either connectionless or steam-generator design, with heavy-load cooking efficiency of at least 38%. Qualified steamers reduce heat loss due to better insulation, improved heat exchange, and more efficient steam delivery systems.

Baseline Description

The baseline efficiency case is a steamer with a 15% cooking efficiency. These performance parameters are drawn from a sample of economy grade equipment tested by the Food Service Technology Center based on ASTM F1484.

Savings Principle

The high efficiency case is an ENERGY STAR® rated natural-gas fired steamer, with a tested heavy-load cooking efficiency of at least 38% utilizing ASTM F1484.

Savings Method

Deemed

Unit

Installed high-efficiency gas-fired steamer.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: 4,380.0.

Hours Source: Environmental Protection Agency (2011). Savings Calculator for ENERGY Star Qualified Commercial Kitchen Equipment: Steam Cooker Calcs. Accessed on 10/12/2011.

Hours Note: The deemed savings assumes 4,380 annual operating hours (12 hours a day * 365 days/year).

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
COOKING-STEAMER-1000	0	0	0.00	370.70	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
COOKING-STEAMER-1000	12	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
COOKING-STEAMER-1000	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Environmental Protection Agency (2011). Savings Calculator for ENERGY STAR Qualified Commercial Kitchen Equipment: Steam Cooker Calcs.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: 100% realization rates are assumed because savings are based on researched assumptions by FSTC.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
COOKING-STEAMER-1000	162060.00	162060.00	0.26	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
COOKING-STEAMER-1000	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $0.78 / Gross therm

Incentive: $0.49 / Gross Therm

DIRECT FIRE HEATER

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: HVAC **Measure Type:** Heating **Measure Sub Type:** Furnace

Program: Large Commercial New Construction

Measure Description

The installation of a high efficiency natural gas warm air furnace with an electronically commutated motor (ECM) for the fan. High efficiency furnaces are better at converting fuel into direct heat and better insulated to reduce heat loss. ECM fan motorssignificantly reduce fan motor electric consumption as compared to both shaped-pole and permanent split capacitor motors.

Baseline Description

The baseline efficiency case is a 85% AFUE furnace in the <150 kBTuh size category.

Savings Principle

The high efficiency case is a new furnace with AFUE >= 96% and an electronically commutated motor.

Savings Method

Deemed

Unit

Installed high-efficiency warm air furnace with ECM fan motor

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
DIRECT FIRE HEATER	0	0	45.20	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
DIRECT FIRE HEATER	20	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
DIRECT FIRE HEATER	0.00%	0.00%	0.00%	0.00%

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
DIRECT FIRE HEATER	0.00	0.00	0.06	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
DIRECT FIRE HEATER	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Domestic Hot Water

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** DHW | **Measure Sub Type:** Year-round

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Domestic Hot Water	Calc	Calc	0.00	Calc	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Domestic Hot Water	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Domestic Hot Water	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Domestic Hot Water	Calc	Calc	0.35	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Domestic Hot Water	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Energy Management System (Building)

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** HVAC | **Measure Sub Type:** Heating

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Energy Management System (Building)	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Energy Management System (Building)	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Energy Management System (Building)	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Energy Management System (Building)	Calc	Calc	-0.07	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Energy Management System (Building)	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

ERV - Fixed Plate UPSTR

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Upstream | **Measure Sub Type:** Energy Recovery Ventilator

Program: Large Commercial New Construction

Measure Description

Installation of a gas fired heated air system with ERV ≥60% total effectiveness.

Baseline Description

The baseline is a gas fired heating system without ERV.

Savings Principle

The high efficiency case is a gas fired heated air system with ERV ≥60% total effectiveness.

Savings Method

Calc

Unit

Installed gas fired heating system with ERV.

Savings Equation

Unit Peak kWh Savings =((4.5*CFM*deltah_cooling)*(1/EER*ERV_E)/1000 - (CFM*PD/6356/Eff_Motor/Eff_fan*0.746*2)*CF

Unit Dth Savings per Year = (4.5*CFM*deltah_heating)/η*((HDD65*24)/(T_indoor-T_design))*(Hours/24))/1,000,000*ERV_E*0.75

Where:

CF = Coincidence Factor = 0.9

CFM=Outside Air Flow in cubic feet per minute

EER = Provided by customer. If SEER provided, SEER*0.875.

Eff_Fan = Efficiency of fan. Provided by customer. If value not provided assume 0.705.

Eff_Motor = Efficiency of motor. Provided bycustomer. If value not provided assume 0.855.

ERV_E = Total Energy Effectiveness of ERV. Provided by manufacturer/customer. If values not provided, fixedplate - sensible heat only = 0.355, fixed plate - sensible&latent heat =0.577, fixedplate - unk = 0.466, rotarywheel = 0.647, heatpipe = 0.31.

Hours = Hours of operation, per day. Provided by customer. If none provided, assume 12.

HDD65 = Heating Degree Days:northern - design cooling h = 32.4 Btu/lbm; cooling return = 28.36 Btu/lbm, HSS65 = 9,833 degF-days; incremental cost = $1.32/CFM

PD = Additional pressure drop through heat exchanger, inches of water column. Provided by customer. If value is not provided, fixedplate - sensible heat only = 0.00035, fixedplate-sensible&latentheat = 0.00074, fixedplate-unk = 0.00055, rotarywheel = 0.00012, heatpipe=0.00011.

T_indoor = Customer provided indoor heating conditioned space temperature in degreesF

η= Efficiency of heating equipment. Assume 0.8 unless different efficiency is provided by customer.

deltah_cooling = difference in enthalpies (btu/lb) between the design day cooling enthalpy and exhaust air heat exchanger inlet enthalpy.

deltah_heating = difference in enthalpies (btu/lb) between the exhaust air heat exchanger inlet enthalpy and design day heatingenthalpy.

1,000 = conversion factor of watts per kWh

1,000,000 = conversion factor for BTU to Dth

0.75 = factor to account for prevention of freezing of condensate. Control strategies incorporate full air flow by-pass or other strategies that reduce the number of hours of operation at lower temperatures, multiply ERE_E by 0.75 if not adjusted by manufacturer or customer.

See MN TRM 3.1 for more detail.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
ERV - Fixed Plate UPSTR	0.0	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Note: It is assumed cooling savings are equal to the increased fan energy usage.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
ERV - Fixed Plate UPSTR	20	1.00	1.00		1.00	1.00	1.00	0.47	0.22

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
ERV - Fixed Plate UPSTR	25.30%	29.30%	24.30%	21.00%

Measure Life Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
ERV - Fixed Plate UPSTR	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
ERV - Fixed Plate UPSTR	0.33	0.12	0.01	0.80

NTG Source: MA 2022 TRM

TRC: $8.28 / Gross therm

Incentive: $1.38 / Gross Therm

ERV - Rotary Wheel UPSTR

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: HVAC | **Measure Type:** Upstream | **Measure Sub Type:** Energy Recovery Ventilator

Program: Large Commercial New Construction

Measure Description

Installation of a gas fired heated air system with ERV ≥60% total effectiveness.

Baseline Description

The baseline is a gas fired heating system without ERV.

Savings Principle

The high efficiency case is a gas fired heated air system with ERV ≥60% total effectiveness.

Savings Method

Calc

Unit

Installed gas fired heating system with ERV.

Savings Equation

Unit Peak kWh Savings =((4.5*CFM*deltah_cooling)*(1/EER*ERV_E)/1000 - (CFM*PD/6356/Eff_Motor/Eff_fan*0.746*2)*CF

Unit Dth Savings per Year = (4.5*CFM*deltah_heating)/η*((HDD65*24)/(T_indoor-T_design))*(Hours/24))/1,000,000*ERV_E*0.75

Where:

CF = Coincidence Factor = 0.9

CFM=Outside Air Flow in cubic feet per minute

EER = Provided by customer. If SEER provided, SEER*0.875.

Eff_Fan = Efficiency of fan. Provided by customer. If value not provided assume 0.705.

Eff_Motor = Efficiency of motor. Provided bycustomer. If value not provided assume 0.855.

ERV_E = Total Energy Effectiveness of ERV. Provided by manufacturer/customer. If values not provided, fixedplate - sensible heat only = 0.355, fixed plate - sensible&latent heat =0.577, fixedplate - unk = 0.466, rotarywheel = 0.647, heatpipe = 0.31.

Hours = Hours of operation, per day. Provided by customer. If none provided, assume 12.

HDD65 = Heating Degree Days:northern - design cooling h = 32.4 Btu/lbm; cooling return = 28.36 Btu/lbm, HSS65 = 9,833 degF-days; incremental cost = $1.32/CFM

PD = Additional pressure drop through heat exchanger, inches of water column. Provided by customer. If value is not provided, fixedplate - sensible heat only = 0.00035, fixedplate-sensible&latentheat = 0.00074, fixedplate-unk = 0.00055, rotarywheel = 0.00012, heatpipe=0.00011.

T_indoor = Customer provided indoor heating conditioned space temperature in degreesF

η= Efficiency of heating equipment. Assume 0.8 unless different efficiency is provided by customer.

deltah_cooling = difference in enthalpies (btu/lb) between the design day cooling enthalpy and exhaust air heat exchanger inlet enthalpy.

deltah_heating = difference in enthalpies (btu/lb) between the exhaust air heat exchanger inlet enthalpy and design day heatingenthalpy.

1,000 = conversion factor of watts per kWh

1,000,000 = conversion factor for BTU to Dth

0.75 = factor to account for prevention of freezing of condensate. Control strategies incorporate full air flow by-pass or other strategies that reduce the number of hours of operation at lower temperatures, multiply ERE_E by 0.75 if not adjusted by manufacturer or customer.

See MN TRM 3.1 for more detail.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
ERV - Rotary Wheel UPSTR	0.0	Calc	Calc	0.00	0.00	0.00	0.00

Electric kWh Note: It is assumed cooling savings are equal to the increased fan energy usage.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
ERV - Rotary Wheel UPSTR	20	1.00	1.00		1.00	1.00	1.00	0.47	0.22

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
ERV - Rotary Wheel UPSTR	25.30%	29.30%	24.30%	21.00%

Measure Life Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRwp Note: Realization rate is 100% since gross savings values are based on evaluation results.

CFsp Source: Guidehouse, MA Residential Baseline Study

CFwp Source: Guidehouse, MA Residential Baseline Study

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
ERV - Rotary Wheel UPSTR	0.00	0.00	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
ERV - Rotary Wheel UPSTR	0.33	0.12	0.01	0.80

NTG Source: MA 2022 TRM

TRC: $9.65 / Gross therm

Incentive: $1.61 / Gross Therm

Food Service

Sector: C&I **Fuel:** Gas **Program Type:** Custom

Measure Category: Custom **Measure Type:** Food Service **Measure Sub Type:** Year-round

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Food Service	Calc	Calc	0.00	Calc	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Food Service	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Food Service	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Food Service	Calc	Calc	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Food Service	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Furnace, Blend

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Furnace | **Measure Sub Type:** Blend

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Furnace, Blend	Calc	Calc	0.00	0.00	Calc	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Furnace, Blend	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Furnace, Blend	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Furnace, Blend	Calc	Calc	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Furnace, Blend	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Furnace, Heating

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Furnace | **Measure Sub Type:** Heating

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Furnace, Heating	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Furnace, Heating	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Furnace, Heating	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Furnace, Heating	Calc	Calc	-0.07	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Furnace, Heating	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Furnace, Year-Round

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Furnace | **Measure Sub Type:** Year-round

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Furnace, Year-Round	Calc	Calc	0.00	Calc	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Furnace, Year-Round	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Furnace, Year-Round	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Furnace, Year-Round	Calc	Calc	0.35	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Furnace, Year-Round	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Furnace95ECM

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: HVAC **Measure Type:** Heating **Measure Sub Type:** Furnace

Program: Large Commercial New Construction

Measure Description

The installation of a high efficiency natural gas warm air furnace with an electronically commutated motor (ECM) for the fan. High efficiency furnaces are better at converting fuel into direct heat and better insulated to reduce heat loss. ECM fan motorssignificantly reduce fan motor electric consumption as compared to both shaped-pole and permanent split capacitor motors.

Baseline Description

The baseline efficiency case is a 85% AFUE furnace in the <150 kBTuh size category.

Savings Principle

The high efficiency case is a new furnace with AFUE >= 95% and an electronically commutated motor.

Savings Method

Deemed

Unit

Installed high-efficiency warm air furnace with ECM fan motor

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Furnace95ECM	168.0	0.1240	5.70	0.00	0.00	0.00	0.00

Electric kWh Source: Energy & Resource Solutions (2011). BFM Impact Evaluation Report. Prepared for the Electric and Gas Program Administrators of Massachusetts.

Electric kW Source: Energy & Resource Solutions (2011). BFM Impact Evaluation Report. Prepared for the Electric and Gas Program Administrators of Massachusetts.

Gas Heat MMBtu Source: DNV GL (2015) Recalculation of Prescriptive Gas Furnace Savings Using a new Baseline

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Furnace95ECM	18	1.00	1.00	1.00		1.00	1.00	0.00	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Furnace95ECM	38.00%	62.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRwp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

CFsp Source: P72 Prescriptive C&I Loadshapes of Savings

CFwp Source: P72 Prescriptive C&I Loadshapes of Savings

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Furnace95ECM	0.00	0.00	0.05	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Furnace95ECM	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Furnace97ECM

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: HVAC **Measure Type:** Heating **Measure Sub Type:** Furnace

Program: Large Commercial New Construction

Measure Description

The installation of a high efficiency natural gas warm air furnace with an electronically commutated motor (ECM) for the fan. High efficiency furnaces are better at converting fuel into direct heat and better insulated to reduce heat loss. ECM fan motorssignificantly reduce fan motor electric consumption as compared to both shaped-pole and permanent split capacitor motors.

Baseline Description

The baseline efficiency case is a 85% AFUE furnace in the <150 kBTuh size category.

Savings Principle

The high efficiency case is a new furnace with AFUE >= 97% and an electronically commutated motor.

Savings Method

Deemed

Unit

Installed high-efficiency warm air furnace with ECM fan motor

Savings Equation

Gross kWh = Qty × deltakWh

Gross kW = Qty × deltakW

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltakWh = Average annual kWh reduction per unit.

deltakW = Average kW reduction per unit.

deltaMMBtu_Gas = Average annual natural gas reduction per unit

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Furnace97ECM	168.0	0.1240	6.70	0.00	0.00	0.00	0.00

Electric kWh Source: Energy & Resource Solutions (2011). BFM Impact Evaluation Report. Prepared for the Electric and Gas Program Administrators of Massachusetts.

Electric kW Source: Energy & Resource Solutions (2011). BFM Impact Evaluation Report. Prepared for the Electric and Gas Program Administrators of Massachusetts.

Gas Heat MMBtu Source: DNV GL (2015) Recalculation of Prescriptive Gas Furnace Savings Using a new Baseline

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Furnace97ECM	18	1.00	1.00	1.00		1.00	1.00	0.00	1.00

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Furnace97ECM	38.00%	62.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

RRsp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

RRwp Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

CFsp Source: P72 Prescriptive C&I Loadshapes of Savings

CFwp Source: P72 Prescriptive C&I Loadshapes of Savings

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Furnace97ECM	0.00	0.00	0.05	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Furnace97ECM	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Gas Driven Cooling

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Cooling | **Measure Sub Type:** Year-round

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Gas Driven Cooling	Calc	Calc	0.00	Calc	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Gas Driven Cooling	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Gas Driven Cooling	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Gas Driven Cooling	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Gas Driven Cooling	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $2.56 / Gross therm

Incentive: $1.60 / Gross Therm

Heat Pump

Sector: C&I **Fuel:** Gas **Program Type:** Custom

Measure Category: Custom **Measure Type:** Heat Pump **Measure Sub Type:** Year-round

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heat Pump	Calc	Calc	0.00	Calc	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heat Pump	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heat Pump	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heat Pump	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heat Pump	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Heat Recovery, Blend

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Heat Recovery | **Measure Sub Type:** Blend

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heat Recovery, Blend	Calc	Calc	0.00	0.00	Calc	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heat Recovery, Blend	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heat Recovery, Blend	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heat Recovery, Blend	Calc	Calc	0.00	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heat Recovery, Blend	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $2.56 / Gross therm

Incentive: $1.60 / Gross Therm

Heat Recovery, Heating

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Heat Recovery | **Measure Sub Type:** Heating

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heat Recovery, Heating	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heat Recovery, Heating	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heat Recovery, Heating	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heat Recovery, Heating	Calc	Calc	-0.07	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heat Recovery, Heating	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $2.56 / Gross therm

Incentive: $1.60 / Gross Therm

Heat Recovery, Year-Round

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Heat Recovery | **Measure Sub Type:** Year-round

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Heat Recovery, Year-Round	Calc	Calc	0.00	Calc	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Heat Recovery, Year-Round	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Heat Recovery, Year-Round	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Heat Recovery, Year-Round	Calc	Calc	0.35	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Heat Recovery, Year-Round	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $2.56 / Gross therm

Incentive: $1.60 / Gross Therm

HVAC

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** HVAC | **Measure Sub Type:** Heating

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
HVAC	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
HVAC	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
HVAC	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
HVAC	Calc	Calc	-0.07	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
HVAC	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

HVAC Insulation

Sector: C&I **Fuel:** Gas **Program Type:** Custom

Measure Category: Custom **Measure Type:** HVAC **Measure Sub Type:** Heating

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
HVAC Insulation	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
HVAC Insulation	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
HVAC Insulation	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
HVAC Insulation	Calc	Calc	-0.07	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
HVAC Insulation	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

INFRARED HEATER - LOW INT

Sector: C&I **Fuel:** Gas **Program Type:** Prescriptive

Measure Category: HVAC **Measure Type:** Heating **Measure Sub Type:** Infrared Heater

Program: Large Commercial New Construction

Measure Description

The installation of a gas-fired low intensity infrared heating system in place of a unit heater, furnace, or other standard efficiency equipment. Infrared heating uses radiant heat as opposed to warm air to heat buildings. In commercial environments withhigh air exchange rates, heat loss is minimal because the space's heat comes from surfaces rather than air.

Baseline Description

The baseline efficiency case is a standard efficiency gas-fired unit heater with combustion efficiency of 80%.

Savings Principle

The high efficiency case is a gas-fired low-intensity infrared heating unit.

Savings Method

Deemed

Unit

Installed infrared heater

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
INFRARED HEATER - LOW INT	0	0.0000	12.00	0.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
INFRARED HEATER - LOW INT	17	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
INFRARED HEATER - LOW INT	0.00%	0.00%	0.00%	0.00%

Measure Life Source: Nexant (2006). DSM Market Characterization Report. Prepared for Questar Gas.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is 100% since gross savings values are based on evaluation results.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
INFRARED HEATER - LOW INT	0.00	0.00	0.06	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
INFRARED HEATER - LOW INT	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $2.56 / Gross therm

Incentive: $1.60 / Gross Therm

Kitchen Equipment

Sector: C&I **Fuel:** Gas **Program Type:** Custom

Measure Category: Custom **Measure Type:** Food Service **Measure Sub Type:** Year-round

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Kitchen Equipment	Calc	Calc	0.00	Calc	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Kitchen Equipment	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Kitchen Equipment	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Kitchen Equipment	Calc	Calc	3.40	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Kitchen Equipment	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Other Blend

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Other | **Measure Sub Type:** Blend

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Other Blend	Calc	Calc	0.00	0.00	Calc	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Other Blend	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Other Blend	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Other Blend	Calc	Calc	-0.03	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Other Blend	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $2.56 / Gross therm

Incentive: $1.60 / Gross Therm

Other Heating

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Other | **Measure Sub Type:** Heating

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Other Heating	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Other Heating	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Other Heating	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Other Heating	Calc	Calc	-0.07	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Other Heating	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $2.56 / Gross therm

Incentive: $1.60 / Gross Therm

Other Year-Round

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Other | **Measure Sub Type:** Year-round

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Other Year-Round	Calc	Calc	0.00	Calc	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Other Year-Round	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Other Year-Round	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Other Year-Round	Calc	Calc	0.35	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Other Year-Round	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $2.56 / Gross therm

Incentive: $1.60 / Gross Therm

Process

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Process | **Measure Sub Type:** Year-round

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Process	Calc	Calc	0.00	Calc	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Process	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Process	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Process	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Process	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Solar Heat Blend

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Solar heat | **Measure Sub Type:** Blend

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Solar Heat Blend	Calc	Calc	0.00	0.00	Calc	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Solar Heat Blend	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Solar Heat Blend	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Solar Heat Blend	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Solar Heat Blend	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Solar Heat Year-Round (DHW)

Sector: C&I **Fuel:** Gas **Program Type:** Custom

Measure Category: Custom **Measure Type:** Solar heat **Measure Sub Type:** Year-round

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Solar Heat Year-Round (DHW)	Calc	Calc	0.00	Calc	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Solar Heat Year-Round (DHW)	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Solar Heat Year-Round (DHW)	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Solar Heat Year-Round (DHW)	Calc	Calc	0.08	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Solar Heat Year-Round (DHW)	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Solar Heating

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Solar heat | **Measure Sub Type:** Heating

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Solar Heating	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Solar Heating	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Solar Heating	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Solar Heating	Calc	Calc	-0.07	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Solar Heating	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Steam Boiler

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Boiler | **Measure Sub Type:** Heating

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Steam Boiler	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Steam Boiler	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Steam Boiler	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Steam Boiler	Calc	Calc	0.35	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Steam Boiler	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Steam Trap

Sector: C&I | **Fuel:** Gas | **Program Type:** Custom

Measure Category: Custom | **Measure Type:** Steam Traps | **Measure Sub Type:** Heating

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Steam Trap	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Steam Trap	6	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Steam Trap	0.00%	0.00%	0.00%	0.00%

Measure Life Source: DNV GL MA 2013,2017 Prescriptive Gas Impact Evaluation: Steam Trap Evaulation Phase 1 & 2

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Steam Trap	Calc	Calc	-0.05	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Steam Trap	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

Ventilation Reduction

Sector: C&I **Fuel:** Gas **Program Type:** Custom

Measure Category: Custom **Measure Type:** Ventilation **Measure Sub Type:** Heating

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
Ventilation Reduction	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
Ventilation Reduction	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
Ventilation Reduction	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
Ventilation Reduction	Calc	Calc	-0.07	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
Ventilation Reduction	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

VSDs on HVAC

Sector: C&I **Fuel:** Gas **Program Type:** Custom

Measure Category: Custom **Measure Type:** VSD **Measure Sub Type:** Heating

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
VSDs on HVAC	Calc	Calc	Calc	0.00	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
VSDs on HVAC	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
VSDs on HVAC	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
VSDs on HVAC	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
VSDs on HVAC	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $2.35 / Gross therm

Incentive: $1.28 / Gross Therm

VSDs on Non-HVAC

Sector: C&I **Fuel:** Gas **Program Type:** Custom

Measure Category: Custom **Measure Type:** VSD **Measure Sub Type:** Year-round

Program: Large Commercial New Construction

Measure Description

The Custom project track is offered for energy efficiency projects involving complex site-specific applications that require detailed engineering analysis and/or projects which do not qualify for incentives under any of the prescriptive rebate offering. Projects offered through the custom approach must pass a cost-effectiveness test based on project-specific costs and savings.

Baseline Description

For Lost Opportunity projects, the baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code or industry accepted standard practice. For retrofit projects, the baseline efficiency case isbased on site-specific information.

Savings Principle

The high efficiency case is specific to the custom project and may include one or more energy efficiency measures. Energy and demand savings calculations are based on projected or measured changes in equipment efficiencies and operating characteristics and are determined on a case-by-case basis. The project must be proven cost-effective in order to qualify for energy efficiency incentives.

Savings Method

Custom

Unit

Installed custom efficiency application.

Savings Equation

Gross kWh = deltakWh_custom

Gross Summer kW = deltakW_sp_custom

Gross Winter kW = deltakW_wp_custom

Gross MMBtu Gas = deltaMMBtu_Gas_custom

Gross MMBtu Oil = deltaMMBtu_Oil_custom

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
VSDs on Non-HVAC	Calc	Calc	0.00	Calc	0.00	Calc	Calc

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
VSDs on Non-HVAC	multi	1.00	1.00	0.83					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
VSDs on Non-HVAC	0.00%	0.00%	0.00%	0.00%

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Source: PY2020 Custom Gas Impact Evaluation

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
VSDs on Non-HVAC	Calc	Calc	0	0

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
VSDs on Non-HVAC	0.48	0.02	0.03	0.58

NTG Source: PY2019 C&I Free Ridership/Spillover study

TRC: $2.35 / Gross therm

Incentive: $1.28 / Gross Therm

WATER HEATER - INDIRECT

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Water Heater | **Measure Sub Type:** Indirect Water Heater

Program: Large Commercial New Construction

Measure Description

The installation of a an indirect water heater that uses a storage tank that is heated by the main boiler. The energy stored by the water tank allows the boiler to turn off and on less often.

Baseline Description

The baseline efficiency case assumes compliance with the efficiency requirements as mandated by Rhode Island State Building Code. For condensing stand-alone water heaters, the baseline is a stand-alone tank water heater with a thermal efficiency of 80%.

Savings Principle

The high efficiency case is an indirect water heater with a Combined Appliance Efficiency (CAE) of 85% or greater.

Savings Method

Deemed

Unit

Installed high-efficiency water heater.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
WATER HEATER - INDIRECT	0	0.0000	0.00	19.00	0.00	0.00	0.00

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
WATER HEATER - INDIRECT	15	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
WATER HEATER - INDIRECT	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
WATER HEATER - INDIRECT	0.00	0.00	0.08	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
WATER HEATER - INDIRECT	0.64	0.00	0.00	0.36

NTG Source: MA C&I HVAC & Water Heater NTG & Market Effects Measurement

TRC: $3.37 / Gross therm

Incentive: $2.10 / Gross Therm

WATER HEATER - ON-DEMAND 94

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Water Heater | **Measure Sub Type:** Tankless Water Heater

Program: Large Commercial New Construction

Measure Description

Tankless water heaters circulate water through a heat exchanger to be heated for immediate use, eliminating the standby heat loss associated with a storage tank.

Baseline Description

The baseline efficiency case is a standalone tank water heater with an energy factor of 0.61.

Savings Principle

The high efficiency case is a tankless water heater that is ENERGY STAR® rated with an Energy Factor of at least 0.94.

Savings Method

Deemed

Unit

Installed high-efficiency water heater.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
WATER HEATER - ON-DEMAND 94	0	0.0000	0.00	9.40	0.00	0.00	0.00

Gas DHW MMBtu Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
WATER HEATER - ON-DEMAND 94	20	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
WATER HEATER - ON-DEMAND 94	0.00%	0.00%	0.00%	0.00%

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
WATER HEATER - ON-DEMAND 94	0.00	0.00	0.35	0

Annual $ Source: O&M and Non-O&M NEI Study (MA20X10-B-CIOMMNEI)

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
WATER HEATER - ON-DEMAND 94	0.62	0.00	0.00	0.38

NTG Source: MA C&I HVAC & Water Heater NTG & Market Effects Measurement

WATER HEATER - ON-DEMAND 95

Sector: C&I | **Fuel:** Gas | **Program Type:** Prescriptive

Measure Category: Water Heating | **Measure Type:** Water Heater | **Measure Sub Type:** Tankless Water Heater

Program: Large Commercial New Construction

Measure Description

Condensing tankless water heaters heat water more efficiently by using either a larger heat exchanger or a second heat exchanger to reduce the flue-gas temperature below dewpoint, and heating water for immediate use, eliminating the standby heat loss associated with a storage tank.

Baseline Description

The baseline efficiency case is a standalone tank water heater with an energy factor of 0.61.

Savings Principle

The high efficiency case is a tankless water heater that is ENERGY STAR® rated with an Energy Factor of at least 0.95.

Savings Method

Deemed

Unit

Installed high-efficiency water heater.

Savings Equation

Gross MMBtu_Gas = Qty × deltaMMBtu_Gas

Where:

Qty = Total number of units.

deltaMMBtu_Gas = Average annual natural gas reduction per unit.

Hours: N/A.

Measure Gross Savings per Unit

Measure	kWh	kW	Gas Heat MMBtu	Gas DHW MMBtu	Gas Other MMBtu	Oil MMBtu	Propane MMBtu
WATER HEATER - ON-DEMAND 95	0	0.0000	0.00	9.50	0.00	0.00	0.00

Gas DHW MMBtu Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

Energy Impact Factors

Measure	Measure Life	ISR	SPF	RRe Gas	RRe Electric	RR sp	RR wp	CF sp	CF wp
WATER HEATER - ON-DEMAND 95	20	1.00	1.00	1.00					

Measure	Winter Peak Energy %	Winter Off-Peak Energy %	Summer Peak Energy %	Summer Off-Peak Energy %
WATER HEATER - ON-DEMAND 95	0.00%	0.00%	0.00%	0.00%

Measure Life Source: GDS Associates, Inc. and Summit Blue Consulting (2009). Natural Gas Energy Efficiency Potential in Massachusetts. Prepared for GasNetworks.

ISR Note: All installations have 100% in-service rate since programs include verification of equipment installations.

SPF Note: Savings persistence is assumed to be 100%.

RRe Note: Realization rate is assumed to be 100% since evaluation adjusts deemed savings value.

Non-Energy Impact Factors

Measure	Water: Gallons	Sewer: Gallons	Annual $	One-time $
WATER HEATER - ON-DEMAND 95	0.00	0.00	0.09	0

Annual $ Source: DNV GL (2015) Massachusetts Electric & Gas Program Administrators: C&I New Construction Non-Energy Impacts Study

Annual $ Note: NEI per therm

Net-to-Gross Factors

Measure	FR	Sop	Sonp	NTG
WATER HEATER - ON-DEMAND 95	0.62	0.00	0.00	0.38

NTG Source: MA C&I HVAC & Water Heater NTG & Market Effects Measurement

Appendix B: Non-Energy Impacts

Table 1: Per Measure Residential Non-Energy Impacts for Electric and Gas Programs

End Use	TRM Measures	NEI	Description	Value or Algorithm	Basis	Duration
Lighting	Indoor Fixture Outdoor Fixture LED Fixture	Lighting Quality and Lifetime	O&M savings due to more efficient fixtures	$3.50	per measure	One Time
	LED Bulb	Lighting Quality and Lifetime	O&M savings due to more efficient bulbs	$3.00	per measure	One Time
Various	All Measures with oil savings	National Security	Reducing the need for foreign energy imports thereby increasing national security	MMBTU Oil Savings * $1.83	per measure	Annual
	All electric measures with kWh savings and all gas measures with MMBTU savings.	Rate Discounts	Financial savings to utility as a result of a smaller portion of energy being sold at the low income rate	**Elec:** (kwh savings per measure)*(A16-A60) **Gas:** (therms savings per measure)*(R12-R13)	per measure	Annual

(1) The NEIs in this table represent impacts that accrue specifically to measures in the 2023 Rhode Island portfolio of programs.

(2) Lighting Quality and Lifetime Source: "Massachusetts Program Administrators: Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation," NMR Group, Inc., Tetra Tech. 8.15.2011

Table 2: Annual per kWh Non-Energy Impacts for Commercial and Industrial Electric Programs

Program		End Use	NEI	Annual $/kWh	Source
New Construction	Prescriptive	Lighting	O&M	0.020	1
		Motors/Drives	O&M, Non-O&M	0.003	3
		EMS	O&M, Non-O&M	0.111	3
		Envelope	O&M, Non-O&M	0.11	3
		Lighting Controls	O&M, Non-O&M	0.07	3
		Refrigeration	O&M, H&S, etc.	0.001	3
		Food Service	O&M, H&S, etc.	0.01	3
	Custom	EMS	O&M, Non-O&M	0.037	3
		Envelope	O&M, Non-O&M	0.036	3
		Lighting Controls	O&M, Non-O&M	0.087	3
		Refrigeration	O&M, Non-O&M	0.012	3
		Process	O&M, Non-O&M	0.091	3
		HVAC	O&M, Non-O&M	0.02	3
		Motors/Drives	O&M, Non-O&M	0.018	3
		Compressed Air	O&M	0.026	1
		Food Service	O&M, H&S, etc.	0.01	3
Retrofit	Prescriptive	HVAC	Administrative costs, other costs, other labor costs, O&M, rent revenue	0.11	2
		Lighting	Administrative costs, material handling, material movement, other labor costs, O&M, sales revenue, waste disposal	0.027	2
		Refrigeration	Administrative costs, material handling, material movement, other costs, other labor costs, O&M, product spoilage, rent revenue, sales revenue,	0.047	2
		EMS	O&M, Non-O&M	0.116	3
		Envelope	O&M, Non-O&M	0.119	3
		Lighting Controls	O&M, Non-O&M	0.101	3
		Motors/Drives	O&M, Non-O&M	0.003	3
		Process	O&M, Non-O&M	0.098	3

		Compressed Air	Administrative costs, material handling, material movement, other costs,	0.056	2
		Food Service	O&M, H&S, etc.	0.01	3
	Custom	EMS	O&M, Non-O&M	0.042	3
		Envelope	O&M, Non-O&M	0.045	3
		Lighting Controls	O&M, Non-O&M	0.084	3
		Motors/Drives	O&M, Non-O&M	0.018	3
		Refrigeration	Administrative costs, material handling, material movement, other costs, other labor costs, O&M, product spoilage, rent revenue, sales revenue,	0.0474	2
		HVAC	O&M, Non-O&M	0.037	3
		CHP Systems	Administrative costs, O&M	-0.0147	2
		Lighting	Administrative costs, material handling, material movement, other costs, other labor costs, O&M, product spoilage, rent revenue, sales revenue,	0.059	2
		Process	O&M, Non-O&M	0.098	3
		Compressed Air	Administrative costs, material handling, material movement, other costs, other labor costs, O&M, product spoilage, rent revenue, sales revenue,	0.056	2
		Food Service	O&M, H&S, etc.	0.01	3

(1) Tetra Tech (2015) Stage 2 Results - Commercial and Industrial New Construction Non-Energy Impacts Study - Final Report

(2) Tetra Tech (2012), Final Report - Commercial and Industrial Non-Energy Impacts Study

(3) DNV (2021). O&M and Non-O&M NEI Study (MA20X10-B-CIOMNEI)

Table 3: Annual per Therm Non-Energy Impacts for Commercial and Industrial Gas Programs

Program		End Use	NEI	Annual $/Therm	Source
New Construction	Prescriptive	Boilers	Admin costs, material movement, other costs, other labor, O&M, product spoilage, waste disposal	-0.08	1
		Other Gas Heating	Admin costs, material movement, other costs, other labor, O&M, product spoilage, waste disposal	0.05	1
		Hot Water	O&M, Non-O&M	0.08	3
		EMS	O&M, Non-O&M	0.68	3
		HVAC	O&M, Non-O&M	0.56	3
		HVAC/Heat Recovery	Admin costs, material movement, other costs, other labor, O&M, product spoilage, waste disposal	0.24	1
		Envelope	O&M, Non-O&M	0.32	3
	Custom	Commercial Kitchen	Admin costs, material movement, other costs, other labor, O&M, product spoilage, waste disposal	3.40	1
		Hot Water	O&M, Non-O&M	0.35	3
		Process	O&M, Non-O&M	-0.05	3
		HVAC	O&M, Non-O&M	-0.07	3
		Other	Admin costs, material movement, other costs, other labor, O&M, product spoilage, waste disposal	-0.03	1
		Envelope	O&M, Non-O&M	0.32	3
Retrofit	Prescriptive	HVAC	Admin costs, material movement, other costs, other labor, O&M, product spoilage, waste disposal	1.35	2
		Hot Water	O&M, Non-O&M	0.08	3
		EMS	O&M, Non-O&M	0.68	3
		Envelope	O&M, Non-O&M	0.32	3
	Custom	HVAC	Admin costs, material movement, other costs, other labor, O&M, product spoilage, waste disposal	0.23	2
		Hot Water	O&M, Non-O&M	0.35	3
		Process	O&M, Non-O&M	-0.05	3
		EMS	O&M, Non-O&M	0.04	3
		Envelope	O&M, Non-O&M	0.32	3

(1) Tetra Tech (2015) Stage 2 Results - Commercial and Industrial New Construction Non-Energy Impacts Study - Final Report

(2) Tetra Tech (2012), Final Report - Commercial and Industrial Non-Energy Impacts Study

(3) DNV (2021). O&M and Non-O&M NEI Study (MA20X10-B-CIOMNEI)

Table 4: Per Participant Non-Energy Impacts for Residential Electric Measures

Program	NEI	Description	Measure Category	Value	Duration
Residential New Construction	Thermal Comfort	Greater participant-perceived comfort in home	Heating System	$91.50	Annual
	Noise Reduction	Less participant-perceived noise in the home		$47.53	Annual
	Asthma Related	Combustion stove NOx		$3.28	Annual
		ERV/HRV reduction of formaldehyde		$0.02	Annual
Residential Cooling and Heating Equipment	Thermal Comfort	Greater participant-perceived comfort in home	Cool Smart AC System	$2.24	Annual
			Cool Smart HP System	$2.88	
			Ductless Mini Split HP System	$2.53	
			Down size 1/2 ton	$0.19	
			QIV and Check up	$0.47	
			Thermostats	$3.07	
	Noise Reduction	Less participant-perceived noise in the home	Cool Smart AC System	$2.03	Annual
	Home Durability	Increased home durability from better quality heating, cooling and structural materials	Cool Smart AC System	$0.65	Annual
			Cool Smart HP System	$0.84	
			Ductless Mini Split HP System	$0.65	
			Down size 1/2 ton	$0.07	
			QIV and Check up	$0.18	
			Thermostats	$1.33	
	Equipment Maintenance	Reduced maintenance costs of owning newer and/or more efficient appliance equipment	Cool Smart AC System	$1.07	Annual
			Cool Smart HP System	$1.34	
			Ductless Mini Split HP System	$0.95	
			Down size 1/2 ton	$0.37	

Program	NEI	Description	Measure Category	Value	Duration
			QIV and Check up	$0.87	
	Health Benefits	Fewer colds and viruses, improved indoor air quality and ease of maintaining healthy relative humidity from weatherization	Cool Smart AC System	$0.07	Annual
			Cool Smart HP System	$0.09	
			Ductless Mini Split HP System	$0.08	
			Down size 1/2 ton	$0.01	
			QIV and Check up	$0.01	
			Thermostats	$0.13	
Energy Star Lighting	Lighting Quality and Lifetime	Better lighting quality and longer life	Residential Lighting - Bulbs	$3.00	One-Time
	Lighting Quality and Lifetime	Better lighting quality and longer life	Residential Lighting - Fixtures	$3.50	One-Time
Single Family - Income Eligible Services	Arrearages	Reduced arrearage carrying costs as a result of customers being more able to pay their lower bills	Basic Educational Measures	$2.61	Annual
	Bad Debt Write-offs	Reduced costs to utility of uncollectable, unpaid balances as a result of customers being more able to pay their lower bills		$3.74	Annual
	Terminations and Reconnections	Reduced costs associated with terminations and reconnections to utility due to nonpayment as a result of customers being more able to pay their lower bills		$0.43	Annual
	Customer Calls and Collections	Utility savings in staff time and materials for fewer customer calls as a result of more timely bill		$0.58	Annual

Program	NEI	Description	Measure Category	Value	Duration
		payments			
	Notices	Financial savings to utility as a result of fewer notices sent to customers for late payments and terminations		$0.34	Annual
	Improved Safety	Reduced risk of fire and fire-related property damage		$2.67	Annual
	Price Hedging		NA	$0.005/kWh	One-Time
	Thermal Comfort	Greater participant-perceived comfort in home	Insulation	$30.13	Annual
			Air Sealing	$35.89	
			Heating System / Heat Pump	$33.24	
			Duct sealing	$0.81	
			Pipe wrap	$6.60	
			Thermostat	$5.78	
	Noise Reduction	Less participant-perceived noise in the home	Insulation	$13.56	Annual
			Air Sealing	$16.39	
	Home Durability	Increased home durability from better quality heating, cooling and structural materials	Insulation	$8.76	Annual
			Air Sealing	$10.61	
			Heat pumps	$9.72	
			Thermostat	$1.68	
			Hot Water System	$0.20	
			Air Sealing	$5.69	
			Duct Sealing	$0.23	
			Heating System	$27.43	

Program	NEI	Description	Measure Category	Value	Duration
			HP Water Heater	$0.20	
	Equipment Maintenance	Reduced maintenance costs of owning newer and/or more efficient appliance equipment	Heating System	$9.72	Annual
			Heat Pumps	$27.43	
	Health Benefits	Fewer colds and viruses, improved indoor air quality and ease of maintaining healthy relative humidity from weatherization	Insulation	$193.15	Annual
			Duct sealing	$5.17	
			Pipe wrap	$42.43	
			Air Sealing	$230.08	
			Heating System/Heat Pumps	213.13	
			Thermostat	37.07	
	Safety-Related Emergency Calls	Financial savings to the utility as a result of fewer safety related emergency calls being made	Heating System/Heat Pumps	$8.43	Annual
	Improved Safety	Reduced risk of fire and fire-related property damage	Insulation	$17.40	Annual
			Air Sealing	$2.24	
			Heating System/ Heat Pumps	$18.87	
			Hot Water System	$4.44	
			Replacement Freezer/Refrigerator	$1.40	
	Thermal Comfort	Greater participant-perceived comfort in home	Window AC	$49.50	Annual
	Property Value Increase		Replacement Freezer/Refrigerator	$26.61	One-Time
			Showerhead	$1.72	
EnergyWise Single Family	Thermal Comfort	Greater participant-perceived comfort in home	Insulation	$25.15	Annual
			Air Sealing	$10.13	
			Thermostat	$3.99	
	Noise Reduction	Less participant-perceived	Insulation	$11.54	Annual

Program	NEI	Description	Measure Category	Value	Duration
		noise in the home	Air Sealing	$4.88	
	Home Durability	Increased home durability in terms of maintenance requirements because of better quality heating, cooling and structural materials	Insulation	$9.82	Annual
			Air Sealing	$3.95	
			Thermostat	$1.33	
	Health Benefits	Fewer colds and viruses, improved indoor air quality and ease of maintaining healthy relative humidity as a result of weatherization in home	Insulation	$0.80	Annual
			Air Sealing	$0.32	
			Thermostat	$0.13	
	Property Value Increase		Showerheads	$0.37	One-Time
			Refrigerator	$1.44	
			Residential Window	$6.72	Annual
EnergyWise Multifamily	Thermal Comfort	Greater participant-perceived comfort in home	Insulation	$25.15	Annual
			Air Sealing	$10.13	
			Thermostat	$3.99	
	Noise Reduction	Less participant-perceived noise in the home	Insulation	$11.54	Annual
			Air Sealing	$4.88	
	Home Durability	Increased home durability in terms of maintenance requirements because of better quality heating, cooling and structural materials	Insulation	$9.82	Annual
			Air Sealing	$2.58	
			Aerator	$0.37	
			Showerheads	$0.37	
			Thermostat	$4.05	
	Health Benefits	Fewer colds and viruses, improved indoor air quality and ease of maintaining healthy relative humidity	Insulation	$0.80	Annual
			Air Sealing	$0.32	

Program	NEI	Description	Measure Category	Value	Duration
		as a result of weatherization in home	Thermostat	$0.13	
	Rental Units Marketability	Financial savings to owners of MF rental housing as a result of increased marketability of the more efficient housing.	Showerheads/Aerator	$0.01	Annual
			Air Sealing	$0.07	
			Refrigerator	$0.34	
			Thermostat	$0.11	
	Reduced Tenant Complaints	Savings to owners of MF rental housing in terms of staff time and materials as a result of fewer tenant complaints with the more efficient measures.	Showerheads/Aerator	$0.20	Annual
			Air Sealing	$1.37	
			Refrigerator	$12.90	
			Thermostat	$2.16	
	Operations & Maintenance		Common Area Lighting	$0.03/kWh	Annual
				$14.12	Annual
	Equipment Maintenance	Reduced maintenance costs of owning newer and/or more efficient appliance equipment	Thermostat	$3.91	Annual
	Lighting Quality and Lifetime	Better lighting quality and longer life	Lighting - Bulbs	$3.00	One-Time
			Lighting - Fixtures	$3.50	One-Time
	Rental Property Value Increase		Refrigerator	$6.86	Annual
EnergyWise Income Eligible Multifamily Retrofit	Arrearages	Reduced arrearage carrying costs as a result of customers being more able to pay lower bills	N/A	$2.61	Annual

Program	NEI	Description	Measure Category	Value	Duration
	Bad Debt Write-offs	Reduced costs to utility of uncollectable, unpaid balances as a result of customers being more able to pay their lower bills		$3.74	Annual
	Terminations and Reconnections	Reduced costs associated with terminations and reconnections to utility due to nonpayment as a result of customers being more able to pay their lower bills		$0.43	Annual
	Customer Calls and Collections	Utility savings in staff time and materials for fewer customer calls as a result of more timely bill payments		$0.58	Annual
	Price Hedging			$0.005/kWh	One-Time
	Notices	Financial savings to utility as a result of fewer notices sent to customers for late payments and terminations		$0.34	Annual
	Thermal Comfort	Greater participant-perceived comfort in home	Insulation	$342.24	Annual
			Heating System	$741.52	
			Heat Pumps – Oil	$836.39	
			Air Sealing	$342.24	
	Noise Reduction	Less participant-perceived noise in the home	Insulation	$13.56	Annual
			Air Sealing	$16.39	
	Home Durability	Increased home durability in terms of maintenance	Insulation	$8.76	Annual
			Air Sealing	$2.58	

Program	NEI	Description	Measure Category	Value	Duration
		requirements because of better quality heating, cooling and structural materials	Heating System	$27.43	
			Thermostat	$4.05	
			Showerheads/Aerator	$0.37	
	Health Benefits	Fewer colds and viruses, improved indoor air quality and ease of maintaining healthy relative humidity as a result of weatherization in home	Insulation	$11.76	Annual
			Heating System	$25.48	
			Air Sealing	$11.76	
	Improved Safety	Reduced risk of fire and fire-related property damage	Insulation	$3.12	Annual
			Air Sealing	$3.12	
			Heating System	$6.76	
	Home Productivity	Reduced bad days due to rest/sleep	Insulation	$11.76	Annual
			Air Sealing	$11.76	
			Heating System	$25.48	
	Rental Units Marketability	Financial savings to owners of MF rental housing as a result of increased marketability of the more efficient housing.	Air Sealing	$0.07	Annual
			Water Heater	$0.01	
			Thermostat	$0.11	
			Common Area Lighting/Fixtures	$0.44	
			Showerheads/Aerator	$0.01	
	Reduced Tenant Complaints	Savings to owners of MF rental housing in terms of staff time and materials as a result of fewer tenant complaints with the more efficient measures.	Air Sealing	$1.37	Annual
			Water Heater	$0.20	
			Thermostat	$2.16	
			Showerheads/Aerator	$0.20	

Program	NEI	Description	Measure Category	Value	Duration
	Safety-Related Emergency Calls	Financial savings to the utility as a result of fewer safety related emergency calls being made	Heating System	$8.43	Annual
	Lighting Quality and Lifetime	Better lighting quality and longer life	Common Area Lighting/Fixtures	$0.03/kWh	Annual
				$16.95	
			Common Area Lighting	$3.00	One-Time
			Common Area Fixtures	$3.50	
	Rental Property Value Increase		Common Area Lighting/Fixtures	$7.83	One-Time
	Equipment Maintenance	Reduced maintenance costs of owning newer and/or more efficient appliance equipment	Heating System	$27.43	Annual
			Thermostat	$3.91	

Sources:

(1) Residential New Construction Source: Massachusetts Program Administrators: Massachusetts Special and Cross-Sector Studies Area, Residential New Construction Quick Hit Non-Energy Impacts (NEI) Evaluation, prepared by NMR Group, Inc. and Three3, Inc.

(2) EnergyWise Single Family and Income Eligible Services Single Family Sources: For Thermal Comfort, Health Benefits, and Improved Safety - "Massachusetts Special and Cross-Cutting Research Area: Low-Income Single-Family Health- and Safety-Related Non-Energy Impacts (NEIs) Study (August 5, 2016) prepared by Three3, Inc. and NMR Group." For other NEIs - "Massachusetts Program Administrators: Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation," NMR Group, Inc., Tetra Tech. 8.15.2011

(3) EnergyWise Multifamily Retrofit Source: Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation, prepared by NMR Group, Inc. and Tetra Tech. Massachusetts Market-Rate Rental Property NEI Study, prepared by NMR Group and DNV GL.

(4) EnergyWise Income Eligible Multifamily Retrofit Source: EnergyWise Multifamily Retrofit Source: Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation, prepared by NMR Group, Inc. and Tetra Tech. Massachusetts Market-Rate Rental Property NEI Study, prepared by NMR Group and DNV GL. Massachusetts Low-Income Multifamily Health- and Safety-Related NEIs Study, prepared by NMR Group, Inc. and Three3, Inc.

(5) Price Hedging Source: Lawrence Berkeley National Laboratory (2002). Quantifying the Value That Wind Power Provides as a Hedge Against Volatile Natural Gas Prices.

Table 5: Per Participant Non-Energy Impacts for Residential Gas Programs

Program	NEI	Description	Measure Category	Value	Duration
Residential Heating and Cooling equipment	Thermal Comfort	Greater participant-perceived comfort in home	Combo Condensing boiler/DHW	$1.21	Annual
			Furnace w/ECM	$27.18	
			Boiler 90%	$27.61	
			Boiler 95%	$27.49	
			Thermostat	$3.99	
	Home Durability	Increased home durability in terms of maintenance requirements because of better quality heating, cooling and structural materials	Combo Condensing boiler/DHW	$0.39	Annual
			DHW - Condensing	$0.70	
			DHW - Tankless	$1.23	
			DHW - Stand Alone	$1.30	
			Furnace w/ECM	$7.12	
			Boiler 90%	$7.33	
			Boiler 95%	$7.28	
			Thermostat	$1.33	
	Equipment Maintenance	Reduced maintenance costs of owning newer and/or more efficient appliance equipment	Combo Condensing boiler/DHW	$1.10	Annual
			Furnace w/ECM	$11.98	
			Boiler 90%	$13.88	
			Boiler 95%	$13.47	
	Health Benefits	Fewer colds and viruses, improved indoor air quality and ease of maintaining healthy relative humidity from weatherization	Combo Condensing boiler/DHW	$0.04	Annual
			Furnace w/ECM	$0.87	
			Boiler 90%	$0.89	
			Boiler 95%	$0.88	
			Thermostat	$0.13	
EnergyWise Single Family	Thermal Comfort	Greater participant-perceived comfort in home	Air Sealing	$10.13	
			Thermostat	$3.99	
			Insulation	$25.15	

Program	NEI	Description	Measure Category	Value	Duration
	Noise Reduction	Less participant-perceived noise in the home	Air Sealing	$4.88	Annual
			Insulation	$11.54	
	Home Durability	Increased home durability from better quality heating, cooling and structural materials	Air Sealing	$3.95	Annual
			Thermostat	$1.33	
			Insulation	$9.82	
	Health Benefits	Fewer colds and viruses, improved indoor air quality and ease of maintaining healthy relative humidity from weatherization	Air Sealing	$0.32	Annual
			Thermostat	$0.13	
			Insulation	$0.80	
EnergyWise Multi Family / C&I Multifamily	Thermal Comfort	Greater participant-perceived comfort in home	Insulation	$25.15	Annual
			Duct Sealing	$0.16	
			Thermostat	$3.99	
			Air Sealing	$10.13	
	Noise Reduction	Less participant-perceived noise in the home	Insulation	$11.54	Annual
			Air Sealing	$4.88	
	Property Durability	Increased home durability in terms of maintenance requirements because of better quality heating, cooling and structural materials	Insulation	$9.82	Annual
			Duct Sealing	$0.06	
			Thermostat	$4.05	
			Showerhead/Aerators	$0.37	
			Air Sealing	$3.95	
	Health Benefits	Fewer colds and viruses, improved indoor air quality and ease of maintaining healthy relative humidity as a result of weatherization in	Insulation	$0.80	Annual
			Duct Sealing	$0.01	
			Thermostat	$0.13	
			Air Sealing	$0.32	

Program	NEI	Description	Measure Category	Value	Duration
		home			
	Equipment Maintenance	Reduced maintenance costs of owning newer and/or more efficient appliance equipment	Thermostat	$3.91	Annual
	Rental Units Marketability	Financial savings to owners of MF rental housing as a result of increased marketability of the more efficient housing.	Thermostat	$0.11	Annual
			Showerhead/Aerators	$0.01	
	Reduced Tenant Complaints	Savings to owners of MF rental housing in terms of staff time and materials as a result of fewer tenant complaints with the more efficient measures.	Thermostat	$2.16	Annual
			Showerhead/Aerators	$0.20	
Single Family - Income Eligible Services	Safety-Related Emergency Calls	Financial savings to the utility as a result of fewer safety related emergency calls being made	Heating System	$8.43	Annual
	Thermal Comfort	Greater participant-perceived comfort in home	Insulation	$30.13	Annual
			Air Sealing	$35.89	
			Heating System	$33.24	
	Noise Reduction	Less participant-perceived noise in the home	Insulation	$13.56	Annual
			Air Sealing	$16.39	
	Home Durability	Increased home durability in terms of maintenance requirements because of better quality heating, cooling and structural materials	Insulation	$8.76	Annual
			Air Sealing	$10.61	
			Heating System	$27.43	

Program	NEI	Description	Measure Category	Value	Duration
	Equipment Maintenance	Reduced maintenance costs of owning newer and/or more efficient appliance equipment	Heating System	$9.72	Annual
	Health Benefits	Fewer colds and viruses, improved indoor air quality and ease of maintaining healthy relative humidity as a result of weatherization in home	Insulation	$193.15	Annual
			Air Sealing	$230.08	
			Heating System	$213.13	
	Improved Safety	Reduced risk of fire and fire-related property damage	Insulation	$17.40	Annual
			Air Sealing	$2.24	
			Heating System	$18.87	
	Price Hedging		N/A	$0.76/MMBtu	One Time
	Arrearages	Reduced arrearage carrying costs as a result of customers being more able to pay their lower bills	Participant	$2.61	Annual
	Bad Debt Write-offs	Reduced costs to utility of uncollectable, unpaid balances as a result of customers being more able to pay their lower bills		$3.74	Annual
	Terminations and Reconnections	Reduced costs associated with terminations and reconnections to utility due to nonpayment as a result of customers being more able to pay their lower bills		$0.43	Annual

Program	NEI	Description	Measure Category	Value	Duration
	Customer Calls and Collections	Utility savings in staff time and materials for fewer customer calls as a result of more timely bill payments		$0.58	Annual
	Notices	Financial savings to utility as a result of fewer notices sent to customers for late payments and terminations		$0.34	Annual
EnergyWise Income Eligible Multifamily Retrofit	Rental Units Marketability	Financial savings to owners of LI rental housing as a result of increased marketability of the more efficient housing.	Air Sealing	$0.07	Annual
			Water Heater	$0.01	
			Showerhead/Aerators	$0.01	
			Thermostat	$0.11	
	Improved Safety	Reduced risk of fire and fire-related property damage	Insulation	$2.40	Annual
			Air Sealing	$0.31	
			Water Heater	$0.61	
			Heating System	$2.60	
	Property Durability	Financial savings to owners of LI rental housing as a result of more durable and efficient materials being installed.	Air Sealing	$2.58	Annual
			Water Heater	$0.37	
			Showerhead/Aerators	$0.37	
			Heating System	$9.72	
	Reduced Tenant Complaints	Savings to owners of LI rental housing in terms of staff time and materials as a result of fewer tenant complaints with the more efficient measures.	Air Sealing	$1.37	Annual
			Water Heater	$0.20	
			Showerhead/Aerators	$0.20	
			Thermostat	$2.16	

Program	NEI	Description	Measure Category	Value	Duration
	Safety-Related Emergency Calls	Financial savings to the utility as a result of fewer safety related emergency calls being made	Heating System	$8.43	Annual
	Price Hedging		N/A	$0.76/MMBtu	One Time
	Arrearages	Reduced arrearage carrying costs as a result of customers being more able to pay their lower bills	Participant	$2.61	Annual
	Bad Debt Write-offs	Reduced costs to utility of uncollectable, unpaid balances as a result of customers being more able to pay their lower bills		$3.74	Annual
	Terminations and Reconnections	Reduced costs associated with terminations and reconnections to utility due to nonpayment as a result of customers being more able to pay their lower bills		$0.43	Annual
	Customer Calls and Collections	Utility savings in staff time and materials for fewer customer calls as a result of more timely bill payments		$0.58	Annual
	Notices	Financial savings to utility as a result of fewer notices sent to customers for late payments and terminations		$0.34	Annual
	Thermal Comfort	Greater participant-perceived comfort in home	Insulation	$42.46	Annual
			Duct Sealing	$0.68	

Program	NEI	Description	Measure Category	Value	Duration
			Air Sealing	$31.73	
			Pipe wrap	$5.56	
			Thermostat	$4.87	
			Heating System	$38.92	
	Noise Reduction	Less participant-perceived noise in the home	Insulation	$13.56	Annual
			Air Sealing	$16.39	
	Property Durability	Increased home durability in terms of maintenance requirements because of better quality heating, cooling and structural materials	Insulation	$8.76	Annual
			Duct Sealing	$0.23	
			Air Sealing	$10.61	
			Thermostat	$4.05	
			Heating System	$9.72	
	Equipment Maintenance	Reduced maintenance costs of owning newer and/or more efficient appliance equipment	Thermostat	$3.91	Annual
			Heating System	$27.43	
	Health Benefits	Fewer colds and viruses, improved indoor air quality and ease of maintaining healthy relative humidity as a result of weatherization in home	Insulation	$33.83	Annual
			Duct Sealing	$0.13	
			Air Sealing	$25.28	
			Pipe wrap	$1.05	
			Thermostat	$0.92	
			Heating System	$31.00	

Sources:

Residential New Construction Source: Massachusetts Program Administrators: Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation, prepared by NMR Group, Inc. and Tetra Tech.

EnergyWise Single Family and Income Eligible Services Single Family Sources: For Thermal Comfort, Health Benefits, and Improved Safety Massachusetts Special and Cross-Cutting Research Area: Low-Income Single-Family Health- and Safety-Related Non-Energy Impacts (NEIs) Study (August 5, 2016) prepared by Three3, Inc. and NMR

Group.For other NEIs - "Massachusetts Program Administrators: Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation," NMR Group, Inc., Tetra Tech. 8.15.2011

EnergyWise Multifamily Retrofit Source: Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation, prepared by NMR Group, Inc. and Tetra Tech. Massachusetts Market-Rate Rental Property NEI Study, prepared by NMR Group and DNV GL.

EnergyWise Income Eligible Multifamily Retrofit Source: EnergyWise Multifamily Retrofit Source: Massachusetts Special and Cross-Sector Studies Area, Residential and Low-Income Non-Energy Impacts (NEI) Evaluation, prepared by NMR Group, Inc. and Tetra Tech. Massachusetts Market-Rate Rental Property NEI Study, prepared by NMR Group and DNV GL. Massachusetts Low-Income Multifamily Health- and Safety-Related NEIs Study (Phase 1), prepared by NMR Group, Inc. and Three3, Inc.

Price Hedging Source: Lawrence Berkeley National Laboratory (2002). Quantifying the Value That Wind Power Provides as a Hedge Against Volatile Natural Gas Prices.

Appendix C: Acronyms

ACRONYM	DESCRIPTION
AC	Air Conditioning
AFUE	Annual Fuel Utilization Efficiency (see the Glossary)
AHU	Air Handling Unit
Btu	British Thermal Unit (see the Glossary)
CF	Coincidence Factor (see the Glossary)
CFL	Compact Fluorescent Lamp
CHP	Combined Heat and Power
COP	Coefficient of Performance (see the Glossary)
DCV	Demand Controlled Ventillation
DHW	Domestic Hot Water
DOER	Department of Energy Resources
DSM	Demand Side Management (see the Glossary)
ECM	Electrically Commutated Motor
EER	Energy Efficiency Ratio (see the Glossary)
EF	Efficiency Factor
EFLH	Equivalent Full Load Hours (see the Glossary)
ES	ENERGY STAR® (see the Glossary)
FCM	Forward Capacity Market
FR	Free-Ridership (see the Glossary)
HE	High-Efficiency
HID	High-Intensity Discharge (a lighting technology)
HP	Horse Power (see the Glossary)
HSPF	Heating Seasonal Performance Factor (see the Glossary)
HVAC	Heating, Ventilating, and Air Conditioning
ISO	Independent System Operator
ISR	In-Service Rate (see the Glossary)
kW	Kilo-Watt, a unit of electric demand equal to 1,000 watts
kWh	Kilowatt-Hour, a unit of energy (1 kilowatt of power supplied for one hour)
LED	Light-Emitting Diode (one type of solid-state lighting)
LCD	Liquid Crystal Display (a technology used for computer monitors and similar displays)
MMBtu	One million British Thermal Units (see “Btu” in the Glossary)
MW	Megawatt – a measure of electric demand equal to 1,000 kilowatts
MWh	Megawatt-hour – a measure of energy equal to 1,000 kilowatt-hours
NEB	Non-Electric Benefit (see the Glossary)
NEI	Non-Energy Impact
NE-ISO	New England Independent System Operator
NTG	Net-to-Gross (see the Glossary)
O&M	Operations and Maintenance
PA	Program Administrator (see the Glossary)
PC	Personal Computer
RR	Realization Rate (see the Glossary)
SEER	Seasonal Energy Efficiency Ratio (see the Glossary)
SO	Spillover (see the Glossary)
SPF	Savings Persistence Factor (see the Glossary)
SSL	Solid-State Lighting (e.g., LED lighting)
VSD	Variable-Speed Drive

Appendix D: Glossary

This glossary provides definitions as they are applied in this TRM for Rhode Island' energy efficiency programs. Alternate definitions may be used for some terms in other contexts.

TERM	DESCRIPTION
Adjusted Gross Savings	Gross savings (as calculated by the measure savings algorithms) that have been subsequently adjusted by the application of all impact factors except the net-to-gross factors (free-ridership and spillover).
AFUE	Annual Fuel Utilization Efficiency. The measure of seasonal or annual efficiency of a furnace or boiler. AFUE takes into account the cyclic on/off operation and associated energy losses of the heating unit as it responds to changes in the load, which in turn is affected by changes in weather and occupant controls.
Baseline Efficiency	The level of efficiency of the equipment that would have been installed without any influence from the program or, for retrofit cases where site-specific information is available, the actual efficiency of the existing equipment.
Btu	British thermal unit. A Btu is approximately the amount of energy needed to heat one pound of water by one degree Fahrenheit.
Coefficient of Performance (COP)	Coefficient of Performance is a measure of the efficiency of a heat pump, air conditioner, or refrigeration system. A COP value is given as the Btu output of a device divided by the Btu input of the device. The input and output are determined at AHRI testing standards conditions designed to reflect peak load operation.
Coincidence Factor (CF)	Coincidence Factors represent the fraction of connected load expected to occur concurrent to a particular system peak period; separate CF are found for summer and winter peaks. The CF given in the TRM includes both coincidence and diversity factors multiplied into one number. Coincidence factors are provided for peak periods defined by the NE-ISO for FCM purposes and calculated consistent with the FCM methodology.
Connected Load kW Savings	The connected load kW savings is the power saved by the equipment while in use. In some cases the savings reflect the maximum power draw of equipment at full load. In other cases the connected load may be variable, which must be accounted for in the savings algorithm.
Deemed Savings	Savings values (electric, fossil fuel and/or non-energy benefits) determined from savings algorithms with assumed values for all algorithm parameters. Alternatively, deemed savings values may be determined from evaluation studies. A measure with deemed savings will have the same savings per unit since all measure assumptions are the same. Deemed savings are used by program administrators to report savings for measures with well-defined performance characteristics relative to baseline efficiency cases. Deemed savings can simplify program planning and design, but may lead to over- or under-estimation of savings depending on product performance.
Deemed Calculated Savings	Savings values (electric, fossil fuel and/or non-energy benefits) that depend on a standard savings algorithm and for which at least one of the algorithm parameters (e.g., hours of operation) is project specific.
Demand Savings	The reduction in demand due to installation of an energy efficiency measure, usually expressed as kW and measured at the customer's meter (see Connected Load kW Savings).
Demand Side Management (DSM)	Strategies used to manage energy demand including energy efficiency, load management, fuel substitution, and load building.

TERM	DESCRIPTION
Diversity	A characteristic of a variety of electric loads whereby individual maximum demands occur at different times. For example, 50 efficient light fixtures may be installed, but they are not necessarily all on at the same time. See Coincidence Factor.
Diversity Factor	This TRM uses coincidence factors that incorporate diversity (See Coincidence Factor), thus this TRM has no separate diversity factors. A diversity factor is typically calculated as: 1) the percent of maximum demand savings from energy efficiency measures available at the time of the company's peak demand, or 2) the ratio of the sum of the demands of a group of users to their coincident maximum demand.
End Use	Refers to the category of end use or service provided by a measure or technology *(*e.g., lighting, cooling, etc.). For the purpose of this manual, the list of end-uses include: Lighting — HVAC Refrigeration — Hot Water Food Service — Behavior Compressed Air — Motors & Drives Products — Custom
Energy Efficiency Ratio (EER)	The Energy Efficiency Ratio is a measure of the efficiency of a cooling system at a specified peak, design temperature, or outdoor temperature. In technical terms, EER is the steady-state rate of heat energy removal (i.e. cooling capacity) of a product measured in Btuh output divided by watts input.
ENERGY STAR® (ES)	Brand name for the voluntary energy efficiency labeling initiative sponsored by the U.S. Environmental Protection Agency.
Energy Costing Period	A period of relatively high or low system energy cost, by season. The energy periods defined by ISO-NE are: • **Summer Peak**: 6am–10pm, Monday–Friday (except ISO holidays), June–September • **Summer Off-Peak:** Summer hours not included in the summer peak hours: 10pm–6am, Monday–Friday, all day on Saturday and Sunday, and ISO holidays, June–September • **Winter Peak:** 6am–10pm, Monday–Friday (except ISO holidays), January–May and October–December • **Winter Off-Peak:** Winter hours not included in the sinter peak hours: 10pm–6am, Monday–Friday, all day on Saturday and Sunday, and ISO holidays, January–May and October–December.
Equivalent Full Load Hours (EFLH)	The equivalent hours that equipment would need to operate at its peak capacity in order to consume its estimated annual kWh consumption (annual kWh/connected kW).
Free Rider	A customer who participates in an energy efficiency program, but would have installed some or all of the same measure(s) on their own, with no change in timing of the installation, if the program had not been available.
Free-Ridership Rate	The percentage of savings attributable to participants who would have installed the measures in the absence of program intervention.
Gross kW	Expected demand reduction based on a comparison of standard or replaced equipment and equipment installed through an energy efficiency program.
Gross kWh	Expected kWh reduction based on a comparison of standard or replaced equipment and equipment installed through an energy efficiency program.
Gross Savings	A saving estimate calculated from objective technical factors. In this TRM, "gross savings" are calculated with the measure algorithms and do not include any application of impact factors. Once impact factors are applied, the savings are called "Adjusted Gross Savings".

TERM	DESCRIPTION
High Efficiency (HE)	Refers to the efficiency measures that are installed and promoted by the energy efficiency programs.
Horsepower (HP)	A unit for measuring the rate of doing work. One horsepower equals about three-fourths of a kilowatt (745.7 watts).
Heating Seasonal Performance Factor (HSPF)	A measure of the seasonal heating mode efficiencies of heat pumps expressed as the ratio of the total heating output to the total seasonal input energy.
Impact Factor	Generic term for a value used to adjust the gross savings estimated by the savings algorithms in order to reflect the actual savings attributable to the efficiency program. In this TRM, impact factors include realization rates, in-service rates, savings persistence, peak demand coincidence factors, free-ridership, spillover and net-to-gross factors. See the section on Impact Factors for more detail.
In-Service Rate	The percentage of units that are actually installed. For example, efficient lamps may have an in-service rate less than 100% since some lamps are purchased as replacement units and are not immediately installed. The in-service rate for most measures is 100%.
Measure Life	The number of years that an efficiency measure is expected to garner savings. These are generally based on engineering lives, but sometimes adjusted based on observations of market conditions.
Lost Opportunity	Refers to a measure being installed at the time of planned investment in new equipment or systems. Often this reflects either new construction, renovation, remodeling, planned expansion or replacement, or replacement of failure.
Measure	A product (a piece of equipment), combination of products, or process designed to provide energy and/or demand savings. Measure can also refer to a service or a practice that provides savings. Measure can also refer to a specific combination of technology and market/customer/practice/strategy (e.g., direct install low income CFL).
Net Savings	The final value of savings that is attributable to a program or measure. Net savings differs from gross savings (or adjusted gross savings) because it includes adjustments due to free-ridership and/or spillover. Net savings is sometimes referred to as "verified" or “final” savings.
Net-to-Gross Ratio	The ratio of net savings to the adjusted gross savings (for a measure or program). The adjusted gross savings include any adjustment by the impact factors other than free-ridership or spillover. Net-to-gross is usually expressed as a percent.
Non-Electric Benefits (NEBs)	Quantifiable benefits (beyond electric savings) that are the result of the installation of a measure. Fossil fuel, water, and maintenance are examples of non-electric benefits. Non-electric benefits can be negative (i.e. increased maintenance or increased fossil fuel usage which results from a measure) and therefore are sometimes referred to as “non-electric impacts”.
Non-Participant	A customer that does not directly participate in an efficiency program.
On-Peak kW	See Summer/Winter On-peak kW
Operating Hours	Hours that a piece of equipment is expected to be in operation, not necessarily at full load (typically expressed per year).
Participant	A customer that reduces or otherwise modifies their energy end use patterns due to involvement in an efficiency program. Participation is measured differently in different programs. For several programs, a participant is defined as a customer account (electric or gas). In contrast, the Residential Consumer Products program measures participation by the number of rebates processed.

TERM	DESCRIPTION
Prescriptive Measure	A prescriptive measure is generally offered by use of a prescriptive form with a prescribed incentive based on the parameters of the efficient equipment or practice.
Realization Rate (RR)	The ratio of measure savings developed from impact evaluations to the estimated measure savings derived from the TRM savings algorithms. This factor is used to adjust the estimated savings when significant justification for such adjustment exists. The components of the realization rate are described in detail in the section on Impact Factors.
Retrofit	The replacement of a piece of equipment or device before the end of its useful or planned life for the purpose of achieving energy savings. "Retrofit" measures are sometimes referred to as "early retirement" when the removal of the old equipment is aggressively pursued.
Savings Persistence Factor (SPF)	Percentage of first-year energy or demand savings expected to persist over the life of the installed energy efficiency equipment. The SPF is developed by conducting surveys of installed equipment several years after installation to determine the operational capability of the equipment. In contrast, *measure persistence* takes into account business turnover, early retirement of installed equipment, and other reasons the installed equipment might be removed or discontinued. Measure persistence is generally incorporated as part of the measure life, and therefore is not included as a separate impact factor.
Seasonal Energy Efficiency Ratio (SEER)	A measurement of the efficiency of a central air conditioner over an entire season. In technical terms, SEER is a measure of equipment the total cooling of a central air conditioner or heat pump (in Btu) during the normal cooling season as compared to the total electric energy input (in watt-hours) consumed during the same period.
Sector	A grouping of participants by customer rate class. Programs are organized by these groupings. There are three sectors: Residential, Income Eligibe, and Commericial and Industrial.
Spillover Rate	The percentage of savings attributable to the program, but additional to the gross (tracked) savings of a program. Spillover includes the effects of (a) participants in the program who install additional energy efficient measures outside of the program as a result of hearing about the program and (b) non-participants who install or influence the installation of energy efficient measures as a result of being aware of the program.
Summer/Winter On-Peak kW	The average demand reduction during the summer/winter on-peak period. The summer on-peak period is 1pm-5pm on non-holiday weekdays in June, July and August; the winter on-peak period is 5pm-7pm on non-holiday weekdays in December and January.
Ton	Unit of measure for determining cooling capacity. One ton equals 12,000 Btu.
Watt	A unit of electrical power. Equal to 1/1000 of a kilowatt.

Fuel	TRM Sector	TRM Program Name	TRM Measure Name	Change/Addition Made	Type of Change	Source of Change	Date of Change
Electric, Gas	**Res, Income Eligible, C&I**	**Identify the program name in the TRM**	**Identify the measure name in the TRM**	**Describe the change made with the values changed**		**Identify the source of the change**	**2023 TRM**
Electric	Res, Income Eligible, C&I	Multiple	Multiple	Added missing values for Winter/summer peak coincidence factors that were missing from the TRM but in the BC model	Alignment with BC Model	BC model	9/23/2022
Electric	C&I	C02a Design 2000plus	ECM Motor - HVAC	Made inactive in TRM based on removal from BC model and not existing in InDemand	Alignment with BC Model	BC model	9/23/2022
Electric	C&I	C03b Small Customers under 200kW	Non-refrigerated snack vending machine	Made inactive in TRM based on removal from BC model and not existing in InDemand	Alignment with BC Model	BC model	9/23/2022
Electric	C&I	C03b Small Customers under 200kW	Custom other	Made inactive in TRM based on removal from BC model and not existing in InDemand	Alignment with BC Model	BC model	9/23/2022
Electric	C&I	C02a Design 2000plus	Food service - blank	Made inactive in TRM based on removal from BC model and not existing in InDemand	Alignment with BC Model	BC model	9/23/2022
Electric	C&I	C03b Small Customers under 200kW	Glass front refrigerated coolers	Made inactive in TRM based on removal from BC model and not existing in InDemand	Alignment with BC Model	BC model	9/23/2022
Electric	Residential	A02a Energy Star Homes	LED Bulbs (linear)	Made inactive in TRM based on removal from BC model and not existing in InDemand	Alignment with BC Model	BC model	9/23/2022
Electric	Residential	A04b Energy Star Products	Low Flow Showerhead thermo Control (ladybug oil. Propane DHW)	Made inactive in TRM based on removal from BC model and not existing in InDemand	Alignment with BC Model	BC model	9/23/2022
Electric	Residential	A04b Energy Star Products	Low Flow Showerhead thermo Control (ladybug gas DHW)	Made inactive in TRM based on removal from BC model and not existing in InDemand	Alignment with BC Model	BC model	9/23/2022
Electric	C&I	C&I Multifamily	Pipe Wrap (Heating)	Made inactive in TRM based on removal from BC model and not existing in InDemand	Alignment with BC Model	BC model	9/23/2022
Electric	Residential	A03b EnergyWise Multifamily	Pipe Wrap (Heating)	Made inactive in TRM based on removal from BC model and not existing in InDemand	Alignment with BC Model	BC model	9/23/2022
Electric	Residential	A03b EnergywiseMF	Pipe Wrap Heating Oil	Made inactive in TRM based on removal from BC model and not existing in InDemand	Alignment with BC Model	BC model	9/23/2022
Electric	C&I	Residential Demand Management	Solar Inverters	Needed to add this to the TRM	Alignment with BC Model		9/16/2022
Electric	C&I	C02a Design 2000plus	ECM Motor - HVAC	removed from TRM 2023 - duplicate measure to ECM-HVAC	Alignment with BC Model	not in InDemand and we already have the prescriptive cool choice ECM-HVAC (Erin C. 7.26.2022)	9/21/2022
Electric	C&I	C03b Small Customers under 200kW	Custom other	removed from TRM 2023 - set as inactive	Alignment with BC Model	unable to map to a measure in inDemand, propose deletion from TRM since there is nothing in InDemand to map to - Erin Crafts 8.1.2022	9/21/2022
Electric	Income Eligible	B03a Low Income Retrofit 1-4	Heating system replacement, Gas	removed from TRM 2023 - set as inactive	Alignment with BC Model	removed from 2023 BC measure list	9/21/2022
Electric	Residential	A04a Energy Star Lighting	LED Bulbs (linear)	removed from TRM 2023 - set as inactive	Alignment with BC Model	discontinued, no longer relevant for this program	9/21/2022
Electric	Residential	A04a Energy Star Lighting	LED Fixture	removed from TRM 2023 - set as inactive	Alignment with BC Model	discontinued, no longer relevant for this program	9/21/2022
Electric	Residential	A04a Energy Star Lighting	LED A Lamps	removed from TRM 2023 - set as inactive	Alignment with BC Model	discontinued, no longer relevant for this program	9/21/2022
Electric	Residential	A04a Energy Star Lighting	LED Bulbs (Specialty)	removed from TRM 2023 - set as inactive	Alignment with BC Model	discontinued, no longer relevant for this program	9/21/2022
Electric	Residential	A04a Energy Star Lighting	School Program LED Bulbs	removed from TRM 2023 - set as inactive	Alignment with BC Model	discontinued, no longer relevant for this program	9/21/2022
Electric	Residential	A04a Energy Star Lighting	HTR LED A Lamps	removed from TRM 2023 - set as inactive	Alignment with BC Model	discontinued, no longer relevant for this program	9/21/2022
Electric	Residential	A04a Energy Star Lighting	LED Reflector	removed from TRM 2023 - set as inactive	Alignment with BC Model	discontinued, no longer relevant for this program	9/21/2022
Electric	Residential	A04a Energy Star Lighting	LED FoodBank	removed from TRM 2023 - set as inactive	Alignment with BC Model	discontinued, no longer relevant for this program	9/21/2022
Electric	Residential	A02a Energy Star Homes	Renovation Rehab Cooling_tier4	removed from TRM 2023 - tier 4 is inactive	Alignment with BC Model	Tier 4 discontinued, not in InDemand	9/21/2022
Electric	Residential	A02a Energy Star Homes	Renovation Rehab Heating_tier4	removed from TRM 2023 - tier 4 is inactive	Alignment with BC Model	Tier 4 discontinued, not in InDemand	9/21/2022
Electric	Residential	A02a Energy Star Homes	Renovation Rehab Domestic Hot Water_tier4	removed from TRM 2023 - tier 4 is inactive	Alignment with BC Model	Tier 4 discontinued, not in InDemand	9/21/2022
Electric	Residential	A02a Energy Star Homes	Cooling_tier4	removed from TRM 2023 - tier 4 is inactive	Alignment with BC Model	Tier 4 discontinued, not in InDemand	9/21/2022
Electric	Residential	A02a Energy Star Homes	DHW_tier4	removed from TRM 2023 - tier 4 is inactive	Alignment with BC Model	Tier 4 discontinued, not in InDemand	9/21/2022
Electric	Residential	A02a Energy Star Homes	Heating_tier4	removed from TRM 2023 - tier 4 is inactive	Alignment with BC Model	Tier 4 discontinued, not in InDemand	9/21/2022
Electric	Residential	Residential New Construction	Heating_tier4	removed from TRM 2023 - tier 4 is inactive	Alignment with BC Model	Tier 4 discontinued, not in InDemand	9/21/2022
Electric	Residential	Residential New Construction	Hot water heating_tier4	removed from TRM 2023 - tier 4 is inactive	Alignment with BC Model	Tier 4 discontinued, not in InDemand	9/21/2022
Electric	Residential	Residential New Construction	Renovation Rehab Heating_tier4 Cooling Gas	removed from TRM 2023 - tier 4 is inactive	Alignment with BC Model	Tier 4 discontinued, not in InDemand	9/21/2022
Electric	Residential	Residential New Construction	Renovation Rehab Heating_tier4	removed from TRM 2023 - tier 4 is inactive	Alignment with BC Model	Tier 4 discontinued, not in InDemand	9/21/2022
Electric	Residential	Residential New Construction	Renovation Rehab Domestic Hot Water_tier4 Gas	removed from TRM 2023 - tier 4 is inactive	Alignment with BC Model	Tier 4 discontinued, not in InDemand	9/21/2022
Electric	Residential	Residential New Construction	Cooling_tier4	removed from TRM 2023 - tier 4 is inactive	Alignment with BC Model	Tier 4 discontinued, not in InDemand	9/21/2022
Electric	Res	Residential Demand Management	Solar Inverters, New	Needed to add this to the TRM	Alignment with BC Model		9/16/2022
Gas	Low Income	Low Income Multifamily	Tankless Water Heater	Made inactive in TRM based on removal from BC model and not existing in InDemand	Alignment with BC Model	BC model	9/23/2022
Gas	Low Income	Low Income Multifamily	Indirect Water Heater	Made inactive in TRM based on removal from BC model and not existing in InDemand	Alignment with BC Model	BC model	9/23/2022
Gas	Low Income	Low Income Multifamily	Stand Alone Water Heater	Made inactive in TRM based on removal from BC model and not existing in InDemand	Alignment with BC Model	BC model	9/23/2022
Electric	Res	Residential Demand Management	Solar Inverters, New	Changed EE: Gross Annual kWh saved to 0	Factor update	MA Solar PFC Demo 2021, assume no savings	9/16/2022
Electric	C&I	C02a C&I Lost Opportunity	Ground source (closed loop) heat pump	ML updated to 25	Factor update	Ground Source Heat Pump eTRM Measure Review MA20C15-B-GSHP	7/8/2022
Electric	C&I	C02a C&I Lost Opportunity	Groundwater source (open loop) heat pump	ML updated to 25	Factor update	Ground Source Heat Pump eTRM Measure Review MA20C15-B-GSHP	7/8/2022

Electric	Res	A03b Residential Retrofit	Aerator, Electric	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Aerator, Electric	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Aerator, Oil	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Aerator, Oil	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Aerator, Others	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Aerator, Others	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Air Sealing Kit, Electric	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Air Sealing Kit, Oil	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Air Sealing Kit, Others	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	LED Bulbs	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	LED Bulbs	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	LED Bulbs (EISA Exempt)	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	LED Fixture	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	LED Outdoor Fixture	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	LED Bulbs Reflectors	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022

Electric	Res	A03b Residential Retrofit	Participant	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Pipe Insulation, Electric	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Pipe Insulation, Oil	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Pipe Insulation, Others	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Pre-weatherization	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Refrigerator Brush	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Showerhead, Electric	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Showerhead, Electric	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Showerhead, Oil	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Showerhead, Oil	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Showerhead, Others	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Showerhead, Others	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Smart Strip	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Programmable Thermostat, Electric	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Programmable Thermostat, Electric	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022

Electric	Res	A03b Residential Retrofit	Programmable Thermostat, Oil	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Programmable Thermostat, Oil	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Programmable Thermostat, Others	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Programmable Thermostat, Others	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	WiFi Thermostat, AC Only	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	WiFi Thermostat, AC Only	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	WiFi Thermostat, Oil	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	WiFi Thermostat, Oil	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	WiFi Thermostat, Others	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	WiFi Thermostat, Others	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	WiFi Thermostat, Electric	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	WiFi Thermostat, Electric	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Weatherization, Electric	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Weatherization, Oil	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	Weatherization, Others	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022

Electric	Res	A03b Residential Retrofit	Electrical Resistance to MSHP	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Electric	Res	A03b Residential Retrofit	update once add new measure	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/16/2022
Electric	Res	A03b Residential Retrofit	update once add new measure	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/16/2022
Electric	Res	A03b Residential Retrofit	update once add new measure	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/16/2022
Electric	Res	A03b Residential Retrofit	update once add new measure	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/16/2022
Electric	C&I	C03b Small C&I Retrofit	Door heater control	Updated CF sp to 0.44 was 0.5	Factor update	Cadmus, "Commercial Refrigeration Load shape Project Final Report", Northeast Energy Efficiency Partnership, Regional Evaluation, Measurement, and Verification Forum, Lexington, MA, 2015 (table 39)	7/7/2022
Electric	C&I	C03b Small C&I Retrofit	Freezer Door Heater Controls	Updated CF sp to 0.44 was 0.5	Factor update	Cadmus, "Commercial Refrigeration Load shape Project Final Report", Northeast Energy Efficiency Partnership, Regional Evaluation, Measurement, and Verification Forum, Lexington, MA, 2015 (table 39)	7/7/2022
Electric	Res	A02b Residential HVAC	WiFi programmable thermostat with cooling (oil)	Updated electric kW to 0.050 was 0.1	Factor update	Navigant Consulting (2018). Baseline Loadshape Study	7/8/2022
Electric	Res	A02a Residential Lost Opportunity	Showerheads	Updated electric kW to 0.059 was 0.02	Factor update	Navigant Consulting (2018). Baseline Loadshape Study	7/8/2022
Electric	Res	A02b Residential HVAC	Duct Sealing - 100 CFM redcution in leaks 15% of flow to 5%	Updated electric kW to 0.310 was 0.3	Factor update	Navigant (2018) Res 34 Home Energy Services Impact Evaluation	7/8/2022
Electric	Res	A02a Residential Lost Opportunity	Showerheads	Updated electric kWh to 247	Factor update	MA Comprehensive TRM Review MA19R17-B-TRM DRAFT	7/8/2022
Electric	Res	A02b Residential HVAC	Duct Sealing - 100 CFM redcution in leaks 15% of flow to 5%	Updated electric kWh to 442 was 212	Factor update	Navigant (2018) Res 34 Home Energy Services Impact Evaluation	7/8/2022
Electric	Res	A04b Energy Star Products	Pool Pump(2-speed)	Updated Electric kWh to 639	Factor update	Guidehouse Comprehensive TRM Review	8/22/2022
Electric	Residential	A04b Residential Appliances	Low Flow Showerhead thermo Control (ladybug gas DHW)	Updated Gas DHW MMBtu to 1.6	Factor update	RI-20-RX-IEMFImpact – Impact Evaluation of Income Eligible Multifamily Program	7/8/2022
Electric	Residential	A03b Residential Retrofit	Showerhead, Electric	Updated ISR to 0.85	Factor update	Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).	7/8/2022
Electric	Residential	A03b Residential Retrofit	Showerhead, Oil	Updated ISR to 0.85	Factor update	Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).	7/8/2022
Electric	Residential	A03b Residential Retrofit	Showerhead, Others	Updated ISR to 0.85	Factor update	Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).	7/8/2022
Electric	Residential	A03b Residential Retrofit	Aerator, Electric	Updated ISR to 0.86	Factor update	Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).	7/8/2022
Electric	Residential	A03b Residential Retrofit	Aerator, Oil	Updated ISR to 0.86	Factor update	Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).	7/8/2022
Electric	Residential	A03b Residential Retrofit	Aerator, Others	Updated ISR to 0.86	Factor update	Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).	7/8/2022
Electric	Residential	A03b Residential Retrofit	Programmable Thermostat, Electric	Updated ISR to 0.88	Factor update	Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).	7/8/2022

Electric	Residential	A03b Residential Retrofit	Programmable Thermostat, Oil	Updated ISR to 0.88	Factor update	Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).	7/8/2022
Electric	Residential	A03b Residential Retrofit	WiFi Thermostat, AC Only	Updated ISR to 0.88	Factor update	Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).	7/8/2022
Electric	Residential	A03b Residential Retrofit	WiFi Thermostat, Oil	Updated ISR to 0.88	Factor update	Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).	7/8/2022
Electric	Residential	A03b Residential Retrofit	WiFi Thermostat, Others	Updated ISR to 0.88	Factor update	Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).	7/8/2022
Electric	Residential	A03b Residential Retrofit	Programmable Thermostat, Others	Updated ISR to 0.88	Factor update	Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).	7/8/2022
Electric	Residential	A03b Residential Retrofit	WiFi Thermostat, Electric	Updated ISR to 0.88	Factor update	Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).	7/8/2022
Electric	Residential	A03b Residential Retrofit	LED Outdoor Fixture	Updated ISR to 0.95	Factor update	Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).	7/8/2022
Electric	Residential	A03b Residential Retrofit	LED Fixture	Updated ISR to 0.95	Factor update	Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).	7/8/2022
Electric	Residential	A03b Residential Retrofit	LED Bulbs	Updated ISR to 0.95	Factor update	Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).	7/8/2022
Electric	Residential	A03b Residential Retrofit	LED Bulbs (EISA Exempt)	Updated ISR to 0.95	Factor update	Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).	7/8/2022
Electric	Residential	A03b Residential Retrofit	LED Bulbs Reflectors	Updated ISR to 0.95	Factor update	Guidehouse. (2021). MA Residential Coordinated Delivery Virtual Home Energy Assessment Study (MA20R26-B-VHEA).	7/8/2022
Electric	C&I	C03a Large C&I Retrofit	LED	Updated kWh RR to 50.47%, kW summer RR 57.82% and kW winter RR to 46.06%. Was 59.6% for all three	Factor update	Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative	7/8/2022
Electric	C&I	C03a Large C&I Retrofit	LED High/Low Bay	Updated kWh RR to 92.82%, kW summer RR 104.65% and kW winter RR to 90.09%	Factor update	P81 Process Evaluation of C&I Upstream Lighting Initiative [new ISRs]	7/8/2022
Electric	C&I	C03a Large C&I Retrofit	Linear LED	Updated kWh RR to 97.92%, kW summer RR 110.4% and kW winter RR to 95.04%	Factor update	Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative	7/8/2022
Electric	C&I	C03a Large C&I Retrofit	LED stairwell	Updated kWh RR, summer kW, winter kW to 86%	Factor update	Impact Evaluation of PY2015 RI C&I Upstream Lighting Initiative and P81 MA Process Evaluation of C&I Upstream Lighting Initiative	7/8/2022
Electric	C&I	C03a Large C&I Retrofit	LED Exterior	Updated kWh RR, summer kW, winter kW to 95%	Factor update	P81 Process Evaluation of C&I Upstream Lighting Initiative [new ISRs]	7/8/2022
Electric	Low Income	B03b Low Income Retrofit Multifamily	AIR SEALING OIL	Updated ML to 20	Factor update	'ComEd Effective Useful Life Research Report', May 2018	7/10/2022
Electric	Low Income	B03b Low Income Retrofit Multifamily	AIR SEALING ELEC WITH AC	Updated ML to 20	Factor update	'ComEd Effective Useful Life Research Report', May 2018	7/10/2022
Electric	Residential	A03b Residential Retrofit Multifamily	AIR SEALING OIL	Updated ML to 20	Factor update	'ComEd Effective Useful Life Research Report', May 2018	7/10/2022
Electric	Residential	A03b Residential Retrofit Multifamily	AIR SEALING ELEC WITH AC	Updated ML to 20	Factor update	'ComEd Effective Useful Life Research Report', May 2018	7/10/2022
Electric	Low Income	B03b Low Income Retrofit Multifamily	Air Sealing	Updated ML to 20	Factor update	'ComEd Effective Useful Life Research Report', May 2018	7/10/2022
Electric	Residential	A03b Residential Retrofit Multifamily	Heating System Retrofit-Boiler	Updated ML to 23 was 20	Factor update	Guidehouse (2021). Comprehensive TRM Review.	7/10/2022
Electric	C&I	C02a C&I Lost Opportunity	Groundwater source (open loop) heat pump	Updated ML to 25	Factor update	Ground Source Heat Pump eTRM Measure Review MA20C15-B-GSHP	7/8/2022
Electric	C&I	C02a C&I Lost Opportunity	Ground source (closed loop) heat pump	Updated ML to 25	Factor update	Ground Source Heat Pump eTRM Measure Review MA20C15-B-GSHP	7/8/2022
Electric	Res	Residential Demand Management	Solar Inverters, Existing	Changed EE: Gross Annual kWh saved to 0	Factor update	MA Solar PFC Demo 2021, assume no savings	9/16/2022
Electric	Residential	A02b Energy Star HVAC	CENTRAL AC	Cooling hours updated to 416	Factor update	Navigant Consulting (2018). RES 1 Baseline Load Shape Study. 2018	7/7/2022

Electric	Residential	A02b Energy Star HVAC	Coolsmart HP QIV ES	Cooling hours updated to 416	Factor update	Navigant Consulting (2018). RES 1 Baseline Load Shape Study. 2018	7/7/2022
Electric	C&I	C02a C&I Lost Opportunity	LEDS	Measure Life Updated to 15	Factor update	MA 2023 BC Model	9/9/2022
Electric	C&I	C02a C&I Lost Opportunity	Lighting Systems	Measure Life Updated to 15	Factor update	MA 2023 BC Model	9/9./2022
Electric	C&I	C02a C&I Lost Opportunity	Performance Lighting	Measure Life Updated to 15	Factor update	MA 2023 BC Model	9/9/2022
Electric	C&I	C02a C&I Lost Opportunity	Prescriptive Lighting	Measure Life Updated to 15 - multiple in BC due to large variety	Factor update	MA 2023 BC Model	9/9/2022
Electric	C&I	C03b Small C&I Retrofit	LED	Measure Life Updated to 2	Factor update	RI C&I Lighting Market and AML Update Study	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	LED Exterior	Measure Life Updated to 5	Factor update	RI C&I Lighting Market and AML Update Study	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	Street Lighting	Measure Life Updated to 5	Factor update	RI C&I Lighting Market and AML Update Study	9/9/2022
Electric	C&I	C03b Small C&I Retrofit	LED EXTERIOR - HW	Measure Life Updated to 5	Factor update	RI C&I Lighting Market and AML Update Study	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	LEDS	Measure Life Updated to 6	Factor update	RI C&I Lighting Market and AML Update Study	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	Prescriptive Lighting / custom lighting	Measure Life Updated to 6	Factor update	RI C&I Lighting Market and AML Update Study, assuming no controls	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	LED stairwell	Measure Life Updated to 6	Factor update	RI C&I Lighting Market and AML Update Study	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	Linear LED	Measure Life Updated to 6	Factor update	RI C&I Lighting Market and AML Update Study	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	Street Lighting with controls	Measure Life Updated to 6	Factor update	RI C&I Lighting Market and AML Update Study	9/9/2022
Electric	C&I	C03b Small C&I Retrofit	CUSTOM LIGHTING	Measure Life Updated to 6	Factor update	RI C&I Lighting Market and AML Update Study	9/9/2022
Electric	C&I	C03b Small C&I Retrofit	Refridgerated Case LED	Measure Life Updated to 6	Factor update	RI C&I Lighting Market and AML Update Study	9/9/2022
Electric	C&I	C03b Small C&I Retrofit	Refrigerated case LED	Measure Life Updated to 6	Factor update	RI C&I Lighting Market and AML Update Study	9/9/2022
Electric	C&I	C03b Small C&I Retrofit	LED Exit Signs	Measure Life Updated to 6	Factor update	RI C&I Lighting Market and AML Update Study	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	LED High/Low Bay	Measure Life Updated to 7	Factor update	RI C&I Lighting Market and AML Update Study	9/9/2022
Electric	C&I	C02a C&I Lost Opportunity	Lighting Controls	Measure Life Updated to 9	Factor update	Dan Mellinger's Lighting Control ML memo	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	Lighting Controls	Measure Life Updated to 9	Factor update	Dan Mellinger's Lighting Control ML memo	9/9/2022
Electric	C&I	C03b Small C&I Retrofit	OCCUPANCY SENSORS	Measure Life Updated to 9	Factor update	Dan Mellinger's Lighting Control ML memo	9/9/2022
Electric	C&I	C03b Small C&I Retrofit	PHOTOCELLS	Measure Life Updated to 9	Factor update	Dan Mellinger's Lighting Control ML memo	9/9/2022
Electric	Res	A04b Energy Star Products	Pool Pump (variable)	Updated Electric kWh to 1284	Factor update	Guidehouse Comprehensive TRM Review	8/22/2022
Electric	C&I	C02a C&I Lost Opportunity	Building Shell	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C02a C&I Lost Opportunity	Chiller	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C02a C&I Lost Opportunity	Compressed Air	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C02a C&I Lost Opportunity	EMS	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C02a C&I Lost Opportunity	Food Service	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C02a C&I Lost Opportunity	Fuel Switch - DHW	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C02a C&I Lost Opportunity	Fuel Switch - HVAC	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C02a C&I Lost Opportunity	Custom HVAC	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C02a C&I Lost Opportunity	Motor	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C02a C&I Lost Opportunity	Other	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C02a C&I Lost Opportunity	Process Cooling	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C02a C&I Lost Opportunity	Process	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C02a C&I Lost Opportunity	Commercial Refridgeration	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C02a C&I Lost Opportunity	VSD-HVAC	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C02a C&I Lost Opportunity	VSD-NON HVAC	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	Custom Compressed Air	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	Comprehensive Retrofit (CR)	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	
Electric	C&I	C03a Large C&I Retrofit	Energy management system	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	Food Service	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	Fuel Switch - DHW	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	Fuel Switch - HVAC	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	Custom HVAC	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/92022
Electric	C&I	C03a Large C&I Retrofit	Custom Motor	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	O & M	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	Custom Other	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022

Electric	C&I	C03a Large C&I Retrofit	Process Cooling	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	Custom Process	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	VSD-HVAC	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	C&I	C03a Large C&I Retrofit	VSD-NON HVAC	Updated kWh RR (83.2%), kW Summer RR(67.2%, kW winter (84.7%), Non Electric RR (83.2%)	Factor update	PY2020 Custom Electric Impact Evaluation	9/9/2022
Electric	Res	A02b Energy Star HVAC	HPWH <55 gallon (electric)	Updated kWh savings (1712 kWh)	Factor update	HPWH Quick Hit Study - Water Heater Characterization	9/13/2022
Electric	Res	A02b Energy Star HVAC	HPWH >55 gallon, UEF 2.70 (electric)	Updated kWh savings (360 kWh)	Factor update	HPWH Quick Hit Study - Water Heater Characterization	9/13/2022
Gas	Residential	A02b Energy Star Heating System	Heat Recovery Ventilation	Gas MMBTU updated to 8.6 , Electric kWh updated to -171, Electric kW updated to 0.02	Factor update	MA Comprehensive TRM Review MA19R17-B-TRM DRAFT	9/21/2022
Gas	Res	A03b Residential Retrofit	Weatherization	ML updated to 25	Factor update	MA Assumption	7/10/2022
Gas	Res	A03b Residential Retrofit	Programmable thermostat	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Gas	Res	A03b Residential Retrofit	Pipe Wrap	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Gas	Res	A03b Residential Retrofit	Weatherization	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Gas	Res	A03b Residential Retrofit	WiFi thermostat	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Gas	Res	A03b Residential Retrofit	Showerhead	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Gas	Res	A03b Residential Retrofit	Aerator	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Gas	Res	A03b Residential Retrofit	Air Sealing Kit, Gas	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/9/2022
Gas	Res	A03b Residential Retrofit	update once add new measure	Spillover (Non-participant rate) changed to 4%	Factor update	Guidehouse Inc., Massachusetts Residential Programs Net-to-Gross Research of RCD and Select Products Measures, prepared for the Electric and Gas Program Administrators of Massachusetts, No. 209974, Boulder, Colorado	9/16/2022
Gas	Res	A02b Residential HVAC	WiFi Enabled Thermostat with Cooling	Updated electric kW to 0.030	Factor update	Navigant Consulting (2018). Baseline Loadshape Study	7/8/2022
Gas	Res	A02b Residential HVAC	WiFi Enabled Thermostat with Cooling	Updated electric kWh to 18 was 104	Factor update	Wi-Fi-Thermostat-Impact-Evaluation-Secondary-Literature-Study_FINAL	7/8/2022
Gas	Res	A04b Residential Appliances	Low Flow Showerhead thermo Control (ladybug electric DHW)	Updated Electric kWh to 247	Factor update	MA Comprehensive TRM Review MA19R17-B-TRM DRAFT	7/8/2022
Gas	Res	A02b Residential HVAC	Furnace (forced hot air) 95% AFUE w/ECM	Updated ML to 17 was 12	Factor update	Guidehouse (2021). Comprehensive TRM Review.	7/10/2022
Gas	Res	A02b Residential HVAC	Furnace (forced hot air) >= 97% AFUE	Updated ML to 17 was 12	Factor update	Guidehouse (2021). Comprehensive TRM Review	7/10/2022
Gas	Res	A03b Residential Retrofit Multifamily	Air Sealing	Updated ML to 20	Factor update	'ComEd Effective Useful Life Research Report', May 2018	7/10/2022
Gas	C&I	C&I Multifamily	Air Sealing	Updated ML to 20	Factor update	'ComEd Effective Useful Life Research Report', May 2018	7/10/2022
Gas	Low Income	B03b Low Income Retrofit Multifamily	Heating System Retrofit, Boiler	Updated ML to 23	Factor update	Guidehouse (2021). Comprehensive TRM Review.	7/10/2022
Gas	Res	A02b Residential HVAC	Integrated water heater/condensing boiler 95	Updated ML to 23 was 17	Factor update	Guidehouse (2021). Comprehensive TRM Revie	7/10/2022
Gas	Low Income	B03b Low Income Retrofit Multifamily	Heating System Retrofit-Boiler	Updated ML to 23 was 20	Factor update	Guidehouse (2021). Comprehensive TRM Review.	7/10/2022
Gas	Res	A02b Residential HVAC	ENERGY STAR STORAGE WATER HEATER .68 UEF (high draw)	Updated NTG to 0.29	Factor update	MA C&I HVAC & Water Heater NTG & Market Effects Measurement	7/72022
Gas	C&I	C02a C&I Lost Opportunity	Advanced Building	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Boiler, Condensing Blend	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Boiler, Condensing Heating	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022

Gas	C&I	C02a C&I Lost Opportunity	Boiler, Condensing Year round	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Boiler, Non-Condensing Blend	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Boiler, Non-Condensing Heating	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Boiler, Non-Condensing Year round	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Building Shell	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Domestic Hot Water	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Energy Management System (building)	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Food Service	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Furnace, Blend	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Furnace, Heating	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Furnace, Year-round	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Gas driven cooling	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Heat Pump	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Heat Recovery, Blend	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Heat Recovery, Heating	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Heat Recovery, Year Round	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	HVAC	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	HVAC insulation	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Kitchen Equipment	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Other Blend	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Other Heating	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Other Year Round	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Process	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Solar Heat Blend	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Solar Heat Year Round (DHW)	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Solar Heating	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Steam boiler	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Steam Trap	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Ventilation Reduction	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	VSDs on HVAC	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	VSDs on non-HVAC	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Boiler, Condensing Blend	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Boiler, Condensing Heating	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Boiler, Condensing Year round	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Boiler, Non-Condensing Blend	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Boiler, Non-Condensing Heating	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Boiler, Non-Condensing Year round	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Building Shell	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Comprehensive Design - CD	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Comprehensive Design - CDA	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Comprehensive Retrofit	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Custom Other	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Domestic Hot Water	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Energy Management System (building)	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Food Service	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Furnace, Blend	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Furnace, Heating	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Furnace, Year-round	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Heat Pump	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Heat Recovery, Blend	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Heat Recovery, Heating	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Heat Recovery, Year Round	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03b Small C&I Retrofit	Not in TRM - custom small business is limited in TRM	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	HVAC	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	HVAC insulation	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Operation & Maintenance	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Other, Blend	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Other, Heating	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Other, Year round	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Process	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Solar Heat Blend	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Solar Heat Year Round (DHW)	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Solar Heating	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Ventilation Reduction	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	Verified Savings	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	VSDs on HVAC	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C03a Large C&I Retrofit	VSDs on non-HVAC	Updated Non-Electric RR to 83%	Factor update	PY2020 Custom Gas Installations in RI	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Comprehensive Design	Updated Non-Electric RR to 97%	Factor update	InDemand - assume path 1 and path 2	9/9/2022
Gas	C&I	C02a C&I Lost Opportunity	Comprehensive Design Assistance	Updated Non-Electric RR to 97%	Factor update	InDemand - assume path 1 and path 3	9/9/2022
Electric	C&I	C03b Small C&I Retrofit	Fan control	NEI annual per kWh updated to 0.003	NEI Update	MA O&M and Non-O&M NEI Study - C&I Motors/Drives - Prescriptive	9/21/2022
Electric	C&I	C03a Large C&I Retrofit	Custom CHP	NEI annual per kWh updated to -0.0147	NEI Update	MA O&M and Non-O&M NEI Study - CHP Systems	9/21/2022
Electric	C&I	C02a C&I Lost Opportunity	CHP	NEI annual per kWh updated to -0.0147	NEI Update	MA O&M and Non-O&M NEI Study - CHP Systems	9/21/2022

Electric	C&I	C03b Small C&I Retrofit	ECM evaporater fan motors (walk-in)	NEI annual per kWh updated to 0.018	NEI Update	MA O&M and Non-O&M NEI Study - C&I Motors/Drives - Custom	9/21/2022
Electric	C&I	C03a Large C&I Retrofit	Custom Motor	NEI annual per kWh updated to 0.018	NEI Update	MA O&M and Non-O&M NEI Study - C&I Motors/Drives - Custom	9/21/2022
Electric	C&I	C02a C&I Lost Opportunity	Motor	NEI annual per kWh updated to 0.018	NEI Update	MA O&M and Non-O&M NEI Study - C&I Motors/Drives - Custom	9/21/2022
Electric	C&I	C03a Large C&I Retrofit	VSD-HVAC	NEI annual per kWh updated to 0.018	NEI Update	MA O&M and Non-O&M NEI Study - C&I Motors/Drives - Custom	9/21/2022
Electric	C&I	C03a Large C&I Retrofit	VSD-NON HVAC	NEI annual per kWh updated to 0.018	NEI Update	MA O&M and Non-O&M NEI Study - C&I Motors/Drives - Custom	9/21/2022
Electric	C&I	C02a C&I Lost Opportunity	VSD-HVAC	NEI annual per kWh updated to 0.018	NEI Update	MA O&M and Non-O&M NEI Study - C&I Motors/Drives - Custom	9/21/2022
Electric	C&I	C02a C&I Lost Opportunity	VSD-NON HVAC	NEI annual per kWh updated to 0.018	NEI Update	MA O&M and Non-O&M NEI Study - C&I Motors/Drives - Custom	9/21/2022
Electric	C&I	C02a C&I Lost Opportunity	Building Shell	NEI annual per kWh updated to 0.036	NEI Update	MA O&M and Non-O&M NEI Study - C&I NC Envelope - Custom	9/21/2022
Electric	C&I	C02a C&I Lost Opportunity	EMS	NEI annual per kWh updated to 0.037	NEI Update	MA O&M and Non-O&M NEI Study - C&I NC EMS - Custom	9/21/2022
Electric	C&I	C03b Small C&I Retrofit	OCCUPANCY SENSORS	NEI annual per kWh updated to 0.084	NEI Update	MA O&M and Non-O&M NEI Study - C&I Retro Lighting Controls - Prescriptive	9/21/2022
Electric	C&I	C03b Small C&I Retrofit	PHOTOCELLS	NEI annual per kWh updated to 0.084	NEI Update	MA O&M and Non-O&M NEI Study - C&I Retro Lighting Controls - Prescriptive	9/21/2022
Electric	C&I	C03b Small C&I Retrofit	TIMECLOCKS	NEI annual per kWh updated to 0.084	NEI Update	MA O&M and Non-O&M NEI Study - C&I Retro Lighting Controls - Prescriptive	9/21/2022
Electric	C&I	C02a C&I Lost Opportunity	Lighting Controls	NEI annual per kWh updated to 0.087	NEI Update	MA O&M and Non-O&M NEI Study - C&I NC Lighting Controls - Custom	9/21/2022
Electric	C&I	C03a Large C&I Retrofit	Lighting Controls	NEI annual per kWh updated to 0.101	NEI Update	MA O&M and Non-O&M NEI Study - C&I Retro Lighting Controls - Custom	9/21/2022
Electric	C&I	C03a Large C&I Retrofit	Street Lighting with controls	NEI annual per kWh updated to 0.101	NEI Update	MA O&M and Non-O&M NEI Study - C&I Retro Lighting Controls - Custom	9/21/2022
Electric	C&I	C03a Large C&I Retrofit	Glass front refridgerated coolers	NEI annual per kWh updated to 0.111	NEI Update	MA O&M and Non-O&M NEI Study - C&I Retro HVAC - Prescriptive	9/21/2022
Electric	C&I	C03a Large C&I Retrofit	Hotel occupancy sensor	NEI annual per kWh updated to 0.111	NEI Update	MA O&M and Non-O&M NEI Study - C&I Retro HVAC - Prescriptive	9/21/2022
Electric	C&I	C03a Large C&I Retrofit	Non-refridgerated snack vending machine	NEI annual per kWh updated to 0.111	NEI Update	MA O&M and Non-O&M NEI Study - C&I Retro HVAC - Prescriptive	9/21/2022
Electric	C&I	C03a Large C&I Retrofit	Refridgerated vending machine	NEI annual per kWh updated to 0.111	NEI Update	MA O&M and Non-O&M NEI Study - C&I Retro HVAC - Prescriptive	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	Energy Management System (building)	NEI annual per therm updated to 0.041	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - EMS	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Energy Management System (building)	NEI annual per therm updated to 0.041	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - EMS	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	Steam Trap	NEI annual per therm updated to -0.045	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - Process	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Boiler, Condensing Blend	NEI annual per therm updated to -0.045	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - Process	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Furnace, Blend	NEI annual per therm updated to -0.045	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - Process	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Heat Recovery, Blend	NEI annual per therm updated to -0.045	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - Process	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Boiler, Non-Condensing Blend	NEI annual per therm updated to -0.045	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - Process	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Process	NEI annual per therm updated to -0.045	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - Process	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Solar Heat Blend	NEI annual per therm updated to -0.045	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - Process	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Boiler, Condensing Heating	NEI annual per therm updated to -0.067	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - HVAC	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Furnace, Heating	NEI annual per therm updated to -0.067	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - HVAC	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Heat Pump	NEI annual per therm updated to -0.067	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - HVAC	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Heat Recovery, Heating	NEI annual per therm updated to -0.067	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - HVAC	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	HVAC	NEI annual per therm updated to -0.067	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - HVAC	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Boiler, Non-Condensing Heating	NEI annual per therm updated to -0.067	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - HVAC	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Other, Heating	NEI annual per therm updated to -0.067	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - HVAC	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	HVAC insulation	NEI annual per therm updated to -0.067	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - HVAC	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Solar Heating	NEI annual per therm updated to -0.067	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - HVAC	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Ventilation Reduction	NEI annual per therm updated to -0.067	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - HVAC	9/21/2022

Gas	C&I	C02a C&I Lost Opportunity	Furnace, Heating	NEI annual per therm updated to -0.067	NEI Update	MA O&M and Non-O&M NEI Study - C&I - New Bldg - Custom - HVAC	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	Heat Recovery, Heating	NEI annual per therm updated to -0.067	NEI Update	MA O&M and Non-O&M NEI Study - C&I - New Bldg - Custom - HVAC	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	HVAC	NEI annual per therm updated to -0.067	NEI Update	MA O&M and Non-O&M NEI Study - C&I - New Bldg - Custom - HVAC	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	Other Heating	NEI annual per therm updated to -0.067	NEI Update	MA O&M and Non-O&M NEI Study - C&I - New Bldg - Custom - HVAC	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	HVAC insulation	NEI annual per therm updated to -0.067	NEI Update	MA O&M and Non-O&M NEI Study - C&I - New Bldg - Custom - HVAC	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	Solar Heating	NEI annual per therm updated to -0.067	NEI Update	MA O&M and Non-O&M NEI Study - C&I - New Bldg - Custom - HVAC	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	Ventilation Reduction	NEI annual per therm updated to -0.067	NEI Update	MA O&M and Non-O&M NEI Study - C&I - New Bldg - Custom - HVAC	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	Solar Heat Year Round (DHW)	NEI annual per therm updated to 0.079	NEI Update	MA O&M and Non-O&M NEI Study - C&I - New Bldg - Prescriptive - Hot Water	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	WATER HEATER - INDIRECT	NEI annual per therm updated to 0.079	NEI Update	MA O&M and Non-O&M NEI Study - C&I - New Bldg - Prescriptive - Hot Water	9/21/2022
Gas	C&I	C03b Small C&I Retrofit	NA - custom measure	NEI annual per therm updated to 0.08	NEI Update	C&I - Existing - Prescriptive - Hot Water	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Faucet Aerator	NEI annual per therm updated to 0.08	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Prescriptive - Hot Water	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Low-Flow Showerhead	NEI annual per therm updated to 0.08	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Prescriptive - Hot Water	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Pre- rinse Spray Valve	NEI annual per therm updated to 0.08	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Prescriptive - Hot Water	9/21/2022
Gas	C&I	C03b Small C&I Retrofit	DEMAND CIRCULATOR	NEI annual per therm updated to 0.08	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Prescriptive - Hot Water	9/21/2022
Gas	C&I	C03b Small C&I Retrofit	Faucet aerator	NEI annual per therm updated to 0.08	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Prescriptive - Hot Water	9/21/2022
Gas	C&I	C03b Small C&I Retrofit	Pre-rinse spray valve	NEI annual per therm updated to 0.08	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Prescriptive - Hot Water	9/21/2022
Gas	C&I	C03b Small C&I Retrofit	Low-flow showerhead	NEI annual per therm updated to 0.08	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Prescriptive - Hot Water	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	Building Shell	NEI annual per therm updated to 0.322	NEI Update	MA O&M and Non-O&M NEI Study -C&I - Envelope	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Building Shell	NEI annual per therm updated to 0.322	NEI Update	MA O&M and Non-O&M NEI Study -C&I - Envelope	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	Steam boiler	NEI annual per therm updated to 0.349	NEI Update	MA O&M and Non-O&M NEI Study - C&I - New Bldg - Custom - Hot Water	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	Domestic Hot Water	NEI annual per therm updated to 0.349	NEI Update	MA O&M and Non-O&M NEI Study - C&I - New Bldg - Custom - Hot Water	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	Furnace, Year-round	NEI annual per therm updated to 0.349	NEI Update	MA O&M and Non-O&M NEI Study - C&I - New Bldg - Custom - Hot Water	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	Heat Recovery, Year Round	NEI annual per therm updated to 0.349	NEI Update	MA O&M and Non-O&M NEI Study - C&I - New Bldg - Custom - Hot Water	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	Other Year Round	NEI annual per therm updated to 0.349	NEI Update	MA O&M and Non-O&M NEI Study - C&I - New Bldg - Custom - Hot Water	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	WATER HEATER - ON-DEMAND 94	NEI annual per therm updated to 0.35	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - Hot Water	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Boiler, Condensing Year round	NEI annual per therm updated to 0.35	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - Hot Water	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Domestic Hot Water	NEI annual per therm updated to 0.35	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - Hot Water	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Furnace, Year-round	NEI annual per therm updated to 0.35	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - Hot Water	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Heat Recovery, Year Round	NEI annual per therm updated to 0.35	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - Hot Water	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Boiler, Non-Condensing Year Round	NEI annual per therm updated to 0.35	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - Hot Water	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Other, Year-round	NEI annual per therm updated to 0.35	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - Hot Water	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Solar Heat Year Round (DHW)	NEI annual per therm updated to 0.35	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Custom - Hot Water	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	BOILER RESET 1 STAGE	NEI annual per therm updated to 0.592	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Prescriptive - HVAC	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Boiler reset control (multi	NEI annual per therm updated to 0.592	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Prescriptive - HVAC	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	Programmable thermostat	NEI annual per therm updated to 0.592	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Prescriptive - HVAC	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	WiFi Thermostat - cooling and htg	NEI annual per therm updated to 0.592	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Prescriptive - HVAC	9/21/2022
Gas	C&I	C03a Large C&I Retrofit	WiFi Tstat-heat only	NEI annual per therm updated to 0.592	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Prescriptive - HVAC	9/21/2022
Gas	C&I	C03b Small C&I Retrofit	WiFi Thermostat - cooling and htg	NEI annual per therm updated to 0.592	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Prescriptive - HVAC	9/21/2022
Gas	C&I	C03b Small C&I Retrofit	WiFi Tstat-heat only	NEI annual per therm updated to 0.592	NEI Update	MA O&M and Non-O&M NEI Study - C&I - Existing - Prescriptive - HVAC	9/21/2022

Electric	C&I	C02a C&I Lost Opportunity	High Perf Contact Conveyor Toaster UPSTR	Added new measure	New measure	MA 2022 BC Model, C&I Existing Buildings Retrofit, Vending Miser, calculated- look at email	9/13/2022
Electric	C&I	C02a C&I Lost Opportunity	Vending Miser - Refrigerated Beverage Vending Machines UPSTR	Added new measure	New measure	MA 2022 BC Model, C&I Existing Buildings Retrofit, Vending Miser, calculated- look at email	9/16/2022
Electric	C&I	C02a C&I Lost Opportunity	Vending Miser - Non-Refrigerated Snack Vending Machines UPSTR	Added new measure	New measure	MA 2022 BC Model, C&I Existing Buildings Retrofit, Vending Miser, calculated- look at email -pg 249 in MA TRM	9/16/2022
Electric	C&I	C02a C&I Lost Opportunity	Vending Miser - Glass Front Refrigerated Coolers UPSTR	Added new measure	New measure	2022 BC Model, calculated - check email	9/16/2022
Electric	Income Eligible	B03b Low Income Retrofit Multifamily	Window - Electric Resistance	Added new measure	New measure	IE SF 2022 MA Impact Factors, check MA TRM to see how calculated - pg 58 of MA TRM	9/16/2022
Electric	Income Eligible	B03b Low Income Retrofit Multifamily	Window - Heat Pump	Added new measure	New measure	IE SF 2022 MA Impact Factors, check MA TRM to see how calculated	9/16/2022
Electric	Income Eligible	B03b Low Income Retrofit Multifamily	Window - Oil	Added new measure	New measure	IE SF 2022 MA Impact Factors, check MA TRM to see how calculated	9/16/2022
Electric	Income Eligible	B03b Low Income Retrofit Multifamily	Window - Propane	Added new measure	New measure	IE SF 2022 MA Impact Factors, check MA TRM to see how calculated	9/16/2022
Electric	Income Eligible	B03a Low Income Retrofit 1-4	Window - Electric Resistance	Added new measure	New measure	IE SF 2022 MA Impact Factors, check MA TRM to see how calculated	9/16/2022
Electric	Income Eligible	B03a Low Income Retrofit 1-4	Window - Heat Pump	Added new measure	New measure	IE SF 2022 MA Impact Factors, check MA TRM to see how calculated	9/16/2022
Electric	Income Eligible	B03a Low Income Retrofit 1-4	Window - Oil	Added new measure	New measure	IE SF 2022 MA Impact Factors, check MA TRM to see how calculated	9/16/2022
Electric	Income Eligible	B03a Low Income Retrofit 1-4	Window - Propane	Added new measure	New measure	IE SF 2022 MA Impact Factors, check MA TRM to see how calculated	9/16/2022
Electric	Res	A03b Residential Retrofit	Electric Resistance to MSHP	Added new measure	New measure	2022 BC Model	6/22/2022
Electric	Res	A03b Residential Retrofit	Window - Electric Resistance	Added new measure	New measure	MA BC Model, calculated check MA TRM to see how calculate	9/16/2022
Electric	Res	A03b Residential Retrofit	Window - Heat Pump	Added new measure	New measure	MA BC Model, calculated check MA TRM to see how calculate	9/16/2022
Electric	Res	A03b Residential Retrofit	Window - Oil	Added new measure	New measure	MA BC Model, calculated check MA TRM to see how calculate	9/16/2022
Electric	Res	A03b Residential Retrofit	Window - Propane	Added new measure	New measure	MA BC Model, calculated check MA TRM to see how calculate	9/16/2022
Electric	Res	A02b Residential HVAC	Window - Electric Resistance	Added new measure	New measure	MA BC Model, calculated check MA TRM to see how calculate	9/16/2022
Electric	Res	A02b Residential HVAC	Window - Heat Pump	Added new measure	New measure	MA BC Model, calculated check MA TRM to see how calculate	9/16/2022
Electric	Res	A02b Residential HVAC	Window - Oil	Added new measure	New measure	MA BC Model, calculated check MA TRM to see how calculate	9/16/2022
Electric	Res	A02b Residential HVAC	Window - Propane	Added new measure	New measure	MA BC Model, calculated check MA TRM to see how calculate	9/16/2022
Electric	Res	Residential Demand Management	Solar Inverters, Existing	Added new measure	New measure	Added based on solar inverters, new in 2022 BC Model, add as deemed check EMV of elec model	9/16/2022
Electric	Res	A04b Residential Appliances	Tricklestar Keyboard	Added new measure	New measure	Based on smart strip - RI BC Model, check with Jen Castor, deemed saving	9/16/2022
Electric	Income Eligible	B03a Low Income Retrofit 1-4	need to add	Added new measure	New measure	MA BC Model	16/2022 - need to check TRC/incentiv
Gas	C&I	C02a C&I Lost Opportunity	condensing boiler <= 300 mbh with 95% AFUE	Added measure to TRM	New measure	Included as a program offering and is in InDemand	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	ERV - Rotary Wheel UPSTR	Added new measure	New measure	MA BC Model/MA 2019-2021 Plan TRM, calculated	9/16/2022
Gas	C&I	C02a C&I Lost Opportunity	ERV - Fixed Plate UPSTR	Added new measure	New measure	MA BC Model/MA 2019-2021 Plan TRM, calculated	9/16/2022
Gas	C&I	C03a Large C&I Retrofit	ERV - Rotary Wheel UPSTR	Added new measure	New measure	MA BC Model/MA 2019-2021 Plan TRM, calculated	9/16/2022
Gas	C&I	C03a Large C&I Retrofit	ERV - Fixed Plate UPSTR	Added new measure	New measure	MA BC Model/MA 2019-2021 Plan TRM, calculated	9/16/2022
Gas	Income Eligible	Bo3b Low Income Retofit Multifamily	Triple Pane Windows	Added new measure	New measure	MA BC Model (Windows - Gas. IE SF)	9/16/2022
Gas	Income Eligible	B03a Low Income Retrofit 1-4	Programmable Thermostat, Gas	Added new measure	New measure	MA Gas BC Model 3 Yr Plan	9/16/2022
Gas	Income Eligible	B03a Low Income Retrofit 1-4	Wi-Fi Thermostat, Gas	Added new measure	New measure	MA Gas BC Model 3 Yr Plan	9/16/2022
Gas	Income Eligible	B03a Low Income Retrofit 1-4	Triple Pane Windows	Added new measure	New measure	MA BC Model (Windows - Gas. IE SF)	9/16/2022
Gas	Res	A03b Residential Retrofit	Triple Pane Windows	Added new measure	New measure	MA BC Model	9/16/2022
Gas	Res	A02b Residential HVAC	Triple Pane Windows	Added new measure	New measure	MA BC Model	9/16/2022
Gas	C&I	C02a C&I Lost Opportunity	condensing boiler <= 300 mbh	updated source in TRM	Source update	C&I Prescriptive and Custom NTG Omnibus Study (MA20X07-B-CIOMNINTG)	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	Condensing boiler 1000-1700 mbh	updated source in TRM	Source update	C&I Prescriptive and Custom NTG Omnibus Study (MA20X07-B-CIOMNINTG)	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	Condensing boiler 1701+ MBH	updated source in TRM	Source update	C&I Prescriptive and Custom NTG Omnibus Study (MA20X07-B-CIOMNINTG)	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	Condensing boiler 300-499 mbh	updated source in TRM	Source update	C&I Prescriptive and Custom NTG Omnibus Study (MA20X07-B-CIOMNINTG)	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	Condensing boiler 500-999 mbh	updated source in TRM	Source update	C&I Prescriptive and Custom NTG Omnibus Study (MA20X07-B-CIOMNINTG)	9/21/2022
Gas	C&I	C02a C&I Lost Opportunity	WATER HEATER TANK 0.67 EF	Updated source of NTG to S299	Source update	MA C&I HVAC & Water Heater NTG & Market Effects Measurement	9/16/2022
Gas	C&I	C02a C&I Lost Opportunity	COND WATER HEATER 90%MIN 75-800	Updated source of NTG to S299	Source update	MA C&I HVAC & Water Heater NTG & Market Effects Measurement	9/16/2022